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"msrll.exe" Analysis

GREM CERTIFICATION

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Version 1.0

GREM Practical Assignment

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EXECUTIVE SUMMARY

The “msrll.exe” malware is an aspacked binary running on Windows systems. If the malware is executed it is installed as service called “RLL enhanced drive”. It moves the original msrll.exe into “C:\WINDOWS\system32\mf” and creates a file called jtram.conf. In which details on IRC server, backdoor and passwords are stored in an encrypted format. The malware registers on the collective7.zxy0.com server either on port tcp/6667, tcp/9999 or tcp/8080 on IRC channel #mils. It further opens a backdoor on port tcp/2200 on the infected systems. The malware has Denial of Service capabilities, such as icmp, udp, tcp-sys, jolt and smurf attack mode. It listens to various commands, which enables it to update, get system information, make file changes, change its configuration and many more. To use these commands a user first has to authenticate with the “?login” command. The initial credentials are “\$1\$KZLPLKdf \$W8kl8Jr1X8DOHZsmlp9qq0”, where “KZLPLKdf “ is the salt and “W8kl8Jr1X8DOHZsmlp9qq0” is the MD5 hashed password. It is also possible to retrieve files by IRC DCC (direct client connection), there the initial credentials are “\$1\$KZLPLKdf \$55isA1ITvamR7bjAdBziX.”

This analysis is presented to fulfill the requirements of Version 1.0 of the GIAC Certified Reverse Engineer Malware (GREM) practical assignment. We hope that this work serves as a valuable and useful contribution to the security community.

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1 LABORATORY SETUP

1.1 Hardware

The laboratory environment used for the malware analysis is based on a Compaq Evo N610c laptop [1] running VMware [2] version 3.2.0. VMware has the advantage that it is able to provide hardware emulation and virtual networking services. It further allows to setup completely independent installations of operating systems on a single physical machine.

The faster machine you use for your host the better, since VMware has to emulate the virtual hardware. Having enough RAM for each virtual system and for the host is critical, since VMware can not emulate the RAM. Each guest operating system requires around 1.5 GB disk space and 128 MB RAM. I used 192 MB and 5 GB disk space for my virtual machines.

Details on my hardware: CPU: Pentium 4-M, 1.8 GHz, Hard disk: 40 GB IDE Internal, L2-Cache: 512 KB, RAM: 512 MB, NIC: 100 Mbps.

1.2 Software

The basic VMware setup is shown in Figure 1. I installed Red Hat Linux v8 [3] as a hosting operating system on my laptop. As mentioned I installed VMware v3.2.0 on the host for the behavioral and code analysis. I had two virtual machines in place. VM-1 with Microsoft Windows XP [4] installed and VM-2 with Linux installed. Details on the VM setup can be found in section 1.2.1 and 1.2.2. The idea behind having multiple virtual machines (VMs) is that you can analyze the malware under several OSes and emulate either the client (infected host) or the server side (side to which the malware tries to connect).

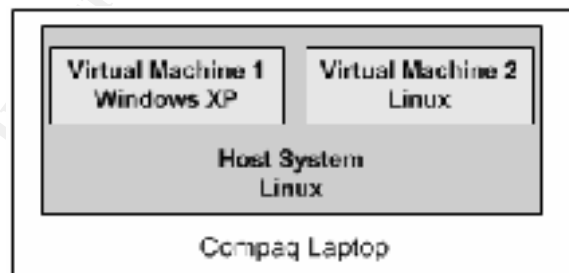


Figure 1: VMware Setup

Another advantage of VMware is the fast re-initialization times. You just have to copy the virtual machine files. Therefore I always kept a clean copy of the Windows and Linux VM.

1.2.1 Windows Virtual Machine

The Windows VM-1 has Service Pack 1 [5] installed. I used it to analyze the malware behavior on the client side. Beside the basic Windows OS I had several tools installed. For the

Behavioral Analysis:

Md5sum [6]: To generate an MD5 [7] hash of a file.

BinText v3.00 [8]: To extract the strings from a binary file.

FileMon v6.07 [9]: To monitor file system activity on my Windows system.

RegMon v6.06 [10]: To monitor registry-related read and write activity.

TDIMon v1.00 [11]: To obtain a log of tcp and udp connections that were initiated or terminated on the system. It also specifies the name of the process associated with the connection.

Fundelete v2.02 [12]: To recover deleted files also from non-GUI processes.

RegShot v1.61e5 [13]: To detect system changes based on a baseline.

ProcExpl v8.3 [14]: To list all running processes on the system.

Code Analysis:

LordPE [15]: To edit PE [16] headers and dump them to memory.

AsPackDie v1.41 [17]: To unpack AS packed executables.

OllyDbg v1.10 [18]: To debug executables.

IDAPro Eval/v3.85 [19]: To disassemble an executable.

1.2.2 Linux Virtual Machine

The Linux VM-2 has Red Hat v8 installed as an OS. I used it to simulate the server side, such as IRC, web, mail, ftp server. Beside the basic Red Hat Linux OS I had several tools installed for the behavioral and the code analysis:

Snort v2.3.0 [20]: Snort is an Intrusion Detection System, but I used it only as a packet sniffer.

Nc v0.7.1 [21]: Netcat was used to emulate a listening service.

Ircd v6.3.1 [22]: To emulate an IRC server.

IrcII v20020912 [23]: As an IRC client.

1.3 Networking

As mentioned in section 1.1 VMware can also emulate networking services between the different VMs.

Figure 2 shows the network topology. The physical NIC eth0 of the system was not used. I run the VMs in host-only network mode to quarantine the laboratory environment from any productive network. The host-only network is called vmnet1 192.168.55.0/24. I further protected the host system by iptables [24] from the VMs. The host system (192.168.55.1) acts as the

default gateway on the host-only vmnet1 network. The Windows VM-1 has the IP address 192.168.55.128 and the Linux VM-2 192.168.55.130.

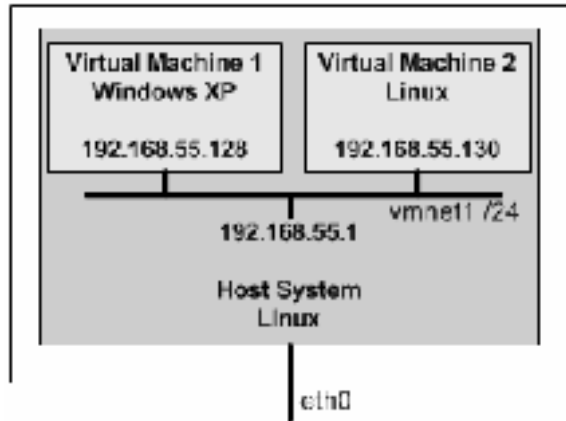


Figure 2: Network Topology

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2 PROPERTIES OF MALWARE SPECIMEN

This document describes the analysis of the malware called: **msrll.exe**. Below are the properties of the malware:

- Type of file:** Windows executable packed by aspack [25]. See analysis in section 3 step 2 and section 4 step 1.
- Size of file:** 41984 bytes. See Figure 3.
- MD5 hash:** 84acfe96a98590813413122c12c11aaa. See Figure 4.
- Created:** Monday, 10. Mai 2004 16:29:54. See Figure 3.
- OS it runs on:** Microsoft Windows
- Embedded strings:** Listed in appendix A.4.1 for the packed and in A.4.2 for the unpacked binary version. Details on the unpacking can be found in section 4 step 1.

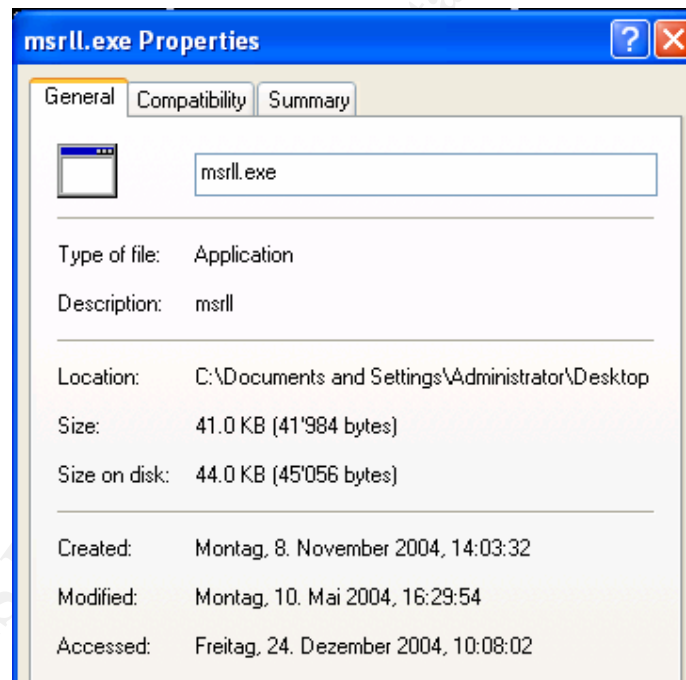


Figure 3: file properties of msrll.exe

```
C:\Documents and Settings\Administrator\Desktop>md5sum.exe msrll.exe  
84acfe96a98590813413122c12c11aaa *msrll.exe
```

Figure 4: md5sum of msrll.exe

3 BEHAVIORAL ANALYSIS

To analyze the malware the following steps were taken:

1. [Win VM-1] Take a fingerprint of the malware to check later that it did not change. Therefore get md5sum of the msrll.exe file. See Figure 4.
2. [Win VM-1] Check if the binary contains any strings that give us information on its behavior. We extract the strings with BinText the complete output can be found in appendix A.4.1.

Analysis: The following string is of interest to us:

```
00000218 00400218 0 .aspack
```

It seems like the file is aspacked. We further see, which DLLs the msrll.exe binary will call during execution.

3. [Win VM-1] Before we execute the msrll.exe we try to collect several information of the clean system and start different monitoring tools to collect as much information of the malware behavior as possible.

We therefore take a snapshot of the current network connections by running `netstat -an` from a DOS prompt, see Figure 5. Now we start FileMon, RegMon, TDIMon and Fundelete to capture the changes on the file system, registry, deleted files from non-GUI processes and tcp/udp activities during malware execution. We further save the state of the registry with RegShot. We run the process explorer ProcExpl to keep track of process changes during malware execution. Now we should have six applications open and running on our VM-1.

```
C:\WINDOWS\System32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.

C:\Documents and Settings\Administrator>netstat -an

Active Connections

Proto Local Address           Foreign Address         State
TCP    0.0.0.0:135              0.0.0.0:*               LISTENING
TCP    0.0.0.0:445              0.0.0.0:*               LISTENING
TCP    0.0.0.0:1025             0.0.0.0:*               LISTENING
TCP    0.0.0.0:1031             0.0.0.0:*               LISTENING
TCP    0.0.0.0:5000             0.0.0.0:*               LISTENING
TCP    192.168.55.131:139      0.0.0.0:*               LISTENING
UDP    0.0.0.0:445              *:*
UDP    0.0.0.0:5000             *:*
UDP    0.0.0.0:1026             *:*
UDP    0.0.0.0:1027             *:*
UDP    127.0.0.1:123            *:*
UDP    127.0.0.1:1900           *:*
UDP    192.168.55.131:123      *:*
UDP    192.168.55.131:137      *:*
UDP    192.168.55.131:138      *:*
UDP    192.168.55.131:1900     *:*
```

Figure 5: Network Connections of Clean System

4. [Linux VM-2] We run a network sniffer to capture packets coming from the infected system. We run `snort -vd | tee ./snoop-`date -I`-`date +%T``

-
5. [Win VM-1] Now we start TDIMon, FileMon, and RegMon by Ctrl-E. We stopped them in step 3, because they would already have started with collecting data.
 6. [Win VM-1] We execute the malware msrll.exe by double-clicking the file.
 7. [Win VM-1] We wait a few seconds and carefully check the ProcExp for new processes. We do not see any new processes just once very quick msrll.exe starts another process. We now save a snapshot of the infected system and its running processes. After that we kill the process called msrll.exe.
 8. [Win VM-1] We stop RegMon, FileMon, and TDIMon by Ctrl-E and save them. Now we take the 2nd RegShot. We save the comparison of shot 1 and shot 2. See output in appendix A.1.1.
 9. [Linux VM-2] We stop also snort.

General Analysis:

- The fact that msrll.exe is no longer at its original location (Desktop) shows us that it was removed or deleted.
- Snort running on VM-2 delivered us nothing interesting than normal Windows NetBIOS traffic. See output in appendix A.1.2.
- If we check the date we see that it was set back 12 days.

Registry Monitoring Analysis (RegShot, RegMon):

RegShot: From the RegShot compare listed in appendix A.1.1, we can conclude that the following files were added:

- Perflib_Perfdata_454.dat into /tmp
- c:\windows\system32\mfm\jtram.conf
- c:\windows\system32\mfm\msrll.exe

The following files were deleted:

- msrll.exe from desktop
- Perflib_Perfdata_454.dat from /tmp

The following files were modified:

- Removed traces in Cookies/index.dat, IE5 history, IE5 temp files, ntuser.dat.log, software.log, system.log

Registry Keys:

- Msrll.exe removed IE5 Extensible Cache key
- C:\WINDOWS\System32\mfm\msrll.exe was installed as a service with the display name RII enhanced drive.

```
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm\Security
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm
    \ImagePath: "C:\WINDOWS\System32\mfm\msrll.exe"
```

```
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfms
\DisplayName: "Rll enhanced drive"
```

RegMon: After having filtered out several non-relevant log entries in RegMon such as the ones from services.exe, explorer.exe, etc. We get the entries from msrll.exe. Analyzing this output we see activities with the following registry keys. Some of them could also be a normal behavior.

- TerminalServices, \Safer\CodeIdentifier, Winlogon, Session Manager, Microsoft RPC, Performance, System Name, Mount Points
- Extensions: exe, ade, adp, asp, bas, bat, chm, cmd, com, cpl, crt
- ZoneMap: ProxyByPass, Telephony
- Microsoft Base Cryptographic Provider v1.0 rsaenh.dll

I could not really get something out of this information. I only assume that the content in jtram.conf was encrypted.

Process Monitoring Analysis (ProcExpI):

We saw that the malware appears as msrll.exe process and does not change.

Network Monitoring Analysis (TDIMon):

We can see from the logs in A.1.3 and the netstat output in Figure 6 that the msrll.exe created a service listening on tcp port 2200. If we connect to this port (telnet 192.168.55.128 2200) we get the command line shown in Figure 7.

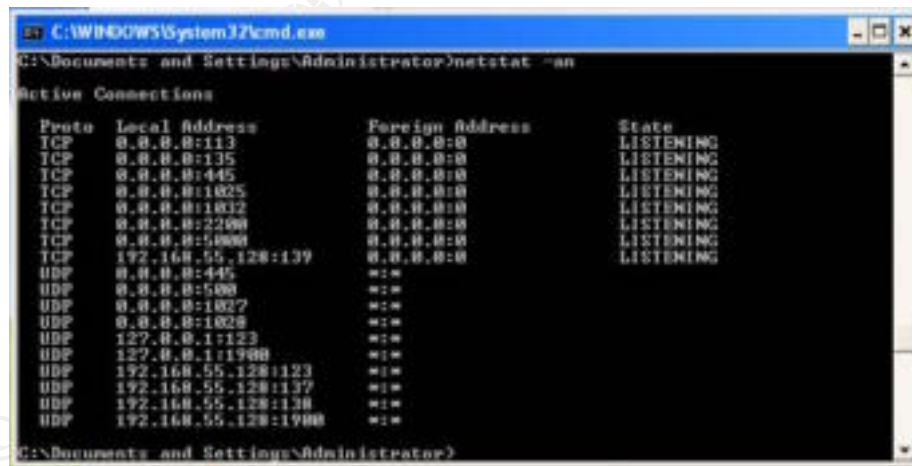


Figure 6: Network Connections of Infected System

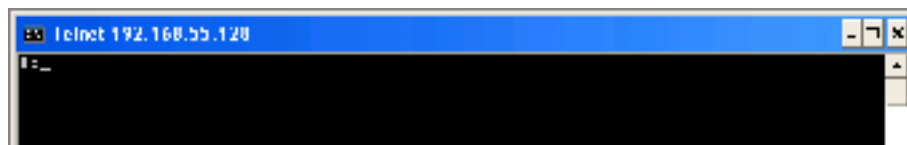


Figure 7: msrll.exe Backdoor

It looks like this is a backdoor. I was not able to get interactive with it and execute commands.

Besides the backdoor no other port was opened or network connections were established. The packet sniffer running on VM-2 also confirmed this.

File System Monitoring Analysis (FileMon, Fundelete)

After filtering out all non-relevant log entries, we can see that the following things happened:

- Creation of C:\WINDOWS\System32\mfm directory.

```
373 14:03:31 msrll.exe:1384 CREATE
      C:\WINDOWS\System32\mfm SUCCESS Options: Create
      Directory Access: All
375 14:03:31 msrll.exe:1384 CLOSE
      C:\WINDOWS\System32\mfm SUCCESS
```

- Creation of C:\WINDOWS\System32\mfm\msrll.exe file and copy the content of Desktop\msrll.exe into System32\msrll.exe.

```
376 14:03:31 msrll.exe:1384 OPEN
      C:\WINDOWS\System32\mfm SUCCESS Options: Open
      Directory Access: Traverse
416 14:03:32 msrll.exe:1384 CREATE
      C:\WINDOWS\System32\mfm\msrll.exe SUCCESS Options:
      OverwriteIf Sequential Access: All
421 14:03:32 msrll.exe:1384 QUERY INFORMATIONC:\Documents
      and Settings\Administrator\Desktop\msrll.exe
      SUCCESS Length: 41984
422 14:03:32 msrll.exe:1384 WRITE
      C:\WINDOWS\System32\mfm\msrll.exe SUCCESS Offset: 0
      Length: 41984
```

To be sure that the file was really copied and not altered, we compare our initial fingerprint (see Figure 4) with the C:\WINDOWS\System32\mfm\msrll.exe md5sum, which is:

84acfe96a98590813413122c12c11aaa *msrll.exe.

As we can see they are really the same.

- Creation of jtram.conf and the writing of data in it.

```
1508 14:04:14 msrll.exe:956 OPEN
      C:\WINDOWS\system32\mfm\jtram.conf FILE NOT FOUND
      Options: Open Access: All
1509 14:04:14 msrll.exe:956 CREATE
      C:\WINDOWS\system32\mfm\jtram.conf SUCCESS Options:
      OverwriteIf Access: All
1723 14:04:19 msrll.exe:956 WRITE
      C:\WINDOWS\system32\mfm\jtram.conf SUCCESS Offset: 0
      Length: 53
...
2469 14:04:32 msrll.exe:956 CLOSE
      C:\WINDOWS\system32\mfm\jtram.conf SUCCESS
```

Fundelete only shows us that msrll.exe was deleted from the initial location.

Summary

The msrll.exe copied itself from the original location to C:\WINDOWS\System32\mfm without changing its content. It further collects performance data of the system and writes several parameters into a newly created file called C:\WINDOWS\System32\mfm\jtram.conf, which contains no strings and seems to be encrypted. The malware installed itself as a service with the display name "RII enhanced drive".

10. [Win VM-1-1] We take a fingerprint of the newly created jtram.conf file to check if it got modified later:

```
f5813e74296bae74eedc7a495b76c560 *jtram.conf
```

Size: 1048 bytes. The content looks like it is encrypted.

11. [Win VM-1-1] We take another RegShot and save it before we reboot the system.

12. [Linux VM-2] We restart snort.

13. [Win VM-1] Reboot system

Analysis

- The ProcExpl, see Figure 8, shows us that msrll.exe is really running now as service. The service cannot be stopped nor started as we see in the service properties Figure 9.

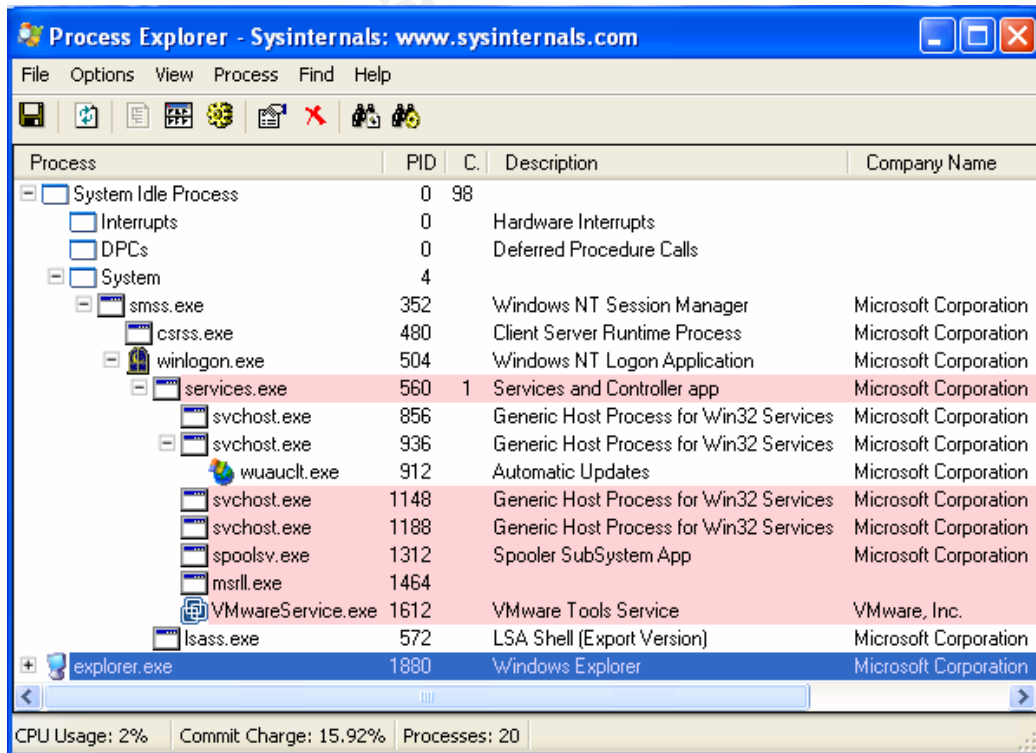


Figure 8: Process Explorer after 1st Reboot

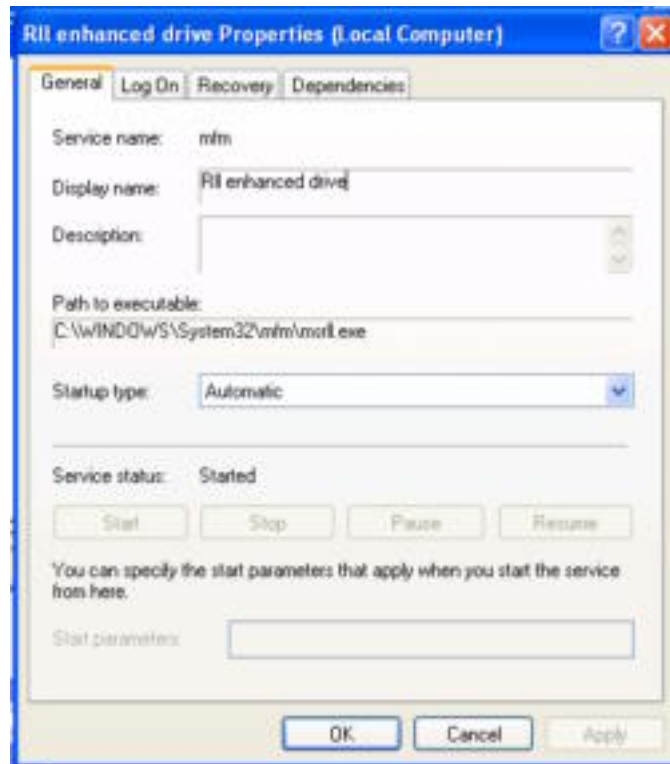


Figure 9: Service Properties

- Snort shows us in A.1.4 that Win VM-1 tries to make a DNS query for collective7.zxy0.com

14. [Win VM-1] We therefore add the IP address 192.168.55.130 in the C:\WINDOWS\System32\drivers\etc\hosts file of the Win VM-1 to resolve the DNS lookup and redirect it to our Linux VM-2.

Analysis

- We see in A.1.5 from the snort output that now the Win VM-1 tries to connect to the Linux VM-2. It tries 3-times to connect on tcp/6667, another 3-times on tcp/9999 and 3-times on tcp/8080. We assume that most likely tcp/6667 and tcp/9999 are IRC connections and tcp/8080 is an http connection.

15. [Linux VM-2] We use netcat to check what kind of protocol it really is. `nc -p 6667 -l -n` and the same for `-p 9999` and `-p 8080`.

Analysis

- We see from the output in A.1.6 that the client speaks the IRC protocol on all three ports.

16. [Win VM-1] Kill msrll.exe with ProcExpl since we cannot stop it.

17. [Linux VM-2] On the Linux VM-2 we run now an IRC server. The ircd should listen on port 6667, 9999 and 8080. A.3.1 contains the configuration file of the IRC server. We connect locally to the IRC server `irc analyst` to check if the malware is connecting.

18. [Win VM-1] Start C:\WINDOWS\System32\mfm\msrll.exe.

Analysis

- From the snort output in A.1.7 and from the irc client output in A.1.8 we see that user “zvWInMFxQ” with nick “mxdVDWqAmYA” registers on channel #mils coming from the Win VM-1.

If we kill the IRC daemon on the server VM-2 and restart it or kill msrll.exe and restart it we see that the malware always registers on the same IRC channel called #mils, but always with a different username and nick. The username and nick even varies in length.

Even so the IRC server listens on all three ports the bot registers itself only once. If we change the ports on the IRC server and let the ircd listening on one of the other ports, we see that the malware registers itself in the following order. (1) On port tcp/6667 if not available on (2) port tcp/9999 and if this one is not available on port tcp/8080.

If the malware should loose its connection it tries right away to registers itself by the round-robin mechanism explained above.

- I tried to interact with the malware on the #mils IRC channel, but it did not react. Most likely there is an authentication method built in to protect the bot infected by the msrll.exe malware.

19. [Win VM-1] I further checked what happens if I remove jtram.conf. When I remove jtram.conf before starting msrll.exe the file is rebuild by msrll.exe. I also saw that jtram.conf is each time msrll.exe is executed rebuilt. From the MD5 sum I could see that the content of the file is always different. We need to check this during Code Analysis.

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4 CODE ANALYSIS

From the behavior analysis we learned that the malware is aspacked and that most likely it will interact over the backdoor on tcp/2200 or over the #mils IRC channel.

4.1 Unpacking the Malware

Unpacking the binary could be done by either dumping the process into memory with the help of OllyDbg or LordPE. Another way would be to unpack the code with the help of a specific unpacking tool. The problem with the second method is that we need the exact counterpart of the packer, but if we succeed with the tool we get the best result. I tried to unpack it with AsPackDie and was lucky. The fingerprint (md5sum) of the unpacked version is:

```
07b93265c372533fc18e6c0138ead8ba *msrll-unpacked.exe
Size: 1'175'552 bytes
```

After extracting the strings with BinText we get several more strings than before. They are listed in A.4.2. From this list it is obvious that commands start with an "?". Unfortunately I could still not get interactive with the bot by using the commands over the IRC channel or the backdoor.

4.2 Malware Code Disassembly

I was loading the unpacked version of msrll.exe into the IDAPro disassembler and scrolled very quickly over the code to get a first impression of the code.

The code starts at 00401240. From the first part of the code (00401399 – 00401791) it looks like the malware bot has the capability to load different kind of software modules and like this extend its functionality. The second part from 00401792 to 00401B63 looks like the bot has several denial of service capabilities built in, by sending IP packets (tcp, icmp, udp) to a destination IP address. Packet size, attack duration, port and delay can be defined. See 004018C1, 00401A2D, 00401B10, 00402079, 00402260. It looks like in the third part (00401B63 – 00403C41) different functions are defined. The fourth part (00403C41 – 004094B4) contains the mIRC [26] client code. It seems like the code was slightly modified and extended. See 00403DF6, 00405B00, 004074C9 and Figure 10, 00408F2C defines the DCC part. DCC [27] stands for direct client connection and is similar to an ftp over ssl/tls for IRC clients. Further proofs on the extensions follow later in the analysis. The next part (004094FF – 0040CA36) contains several interesting things such as "PASS" (00405B58), which is most likely the authentication part, reboot, kill processes, system info are other functions. 004099E0 contains the call to jtram.conf further down other files are followed such as jtr.bin, jtr.home, jtr.id. 0040BFEF contains an SSL part. Between 0040C262 and 0040C527 it looks like performance values are collected. 0040C4D8 contains the path to msrll.exe. In 0040CA36 the "RLL enhanced drive" service is created. The part from (004110C8 – 004126D4) looks like the

LibTomCrypt library v0.83 [28] see Figure 11. This gives us a generic overview of what we have to expect from the malware.

```

.text:004074C9 ; -----
.text:004074C9 0AhircU6 12Khalc db 'nIRC v0.12 Khaled Mardam-Bey',0
.lexl:004074C9          ; DATA XREF: .text:00407419J0
.lexl:004074D1 00000000 db '2255A810, 00000000, 12321200'
.lexl:004074D1          ; DATA XREF: .text:00407419J0
.lexl:004074D2          db 0
.lexl:004074D3 ;
.text:004074F3          push  ebp
.text:004074F4          mov   ebp, esp
.text:004074F6          sub   esp, 14h
.text:004074F9          push  offset 0AhircU6 12Khalc ; "nIRC v0.12 Khaled Mardam-Bey"

```

Figure 10: mIRC IDA Snapshot

```

.text:004110FA alibtomcryptA A db 'LibTomCrypt A.AA',AAh
.lexl:004110F0          db 0Ah
.text:004110F0          db 'Endianness: little (32-bit words)',AAh
.text:004110F0          db 'Clean stack: disabled',AAh
.lexl:004110FA          all  'Ciphers: built-in:',AAh
.text:004110F0          db  'Blowfish',AAh
.text:004110F0          db  'RC2',AAh
.text:004110F0          db  'RC5',AAh
.lexl:004110FA          all  'RC6',AAh
.text:004110F0          db  'Serpent',AAh
.text:004110F0          db  'Safes',AAh
.lexl:004110FA          all  'Safes',AAh
.text:004110F0          db  'rijndael',AAh
.text:004110F0          db  'XTCA',AAh
.lexl:004110FA          all  'Twofish',AAh
.lexl:004110F0          db  'CAST5',AAh
.text:004110F0          db  'Mackean',AAh

```

Figure 11: LibTomCrypt IDA Snapshot

4.3 Debugging Malware

My goal was to get interactive with the bot. Therefore I loaded the unpacked version of msrll.exe into OllyDbg and set a breakpoint at the “?login” command (40935D). Now I entered “?login passwd salt” on the #mils IRC channel since I saw at msrll.00407360 the string %s <pass> <salt> and thought that maybe the login requires a password and a salt.

I ended up with the subroutine 00403256, shown in Figure 12, which reads the commands from memory starting at 003D3DA8 with “?si”. The memory dump with the commands is listed in A.2.1. In A.2.5 only the commands are listed. At 00403263 the subroutine msrll.0040CEA3 is called. This subroutine makes a string compare of the entered command in our case “?login” and the command read out of the memory. “*” and “\” characters are treated differently, but this is of no interest for our goal to get interactive with the bot. If the compared commands are not the same EAX will be empty. If the compared commands are the same EAX contains the length of the command. In our case this would be six. An interesting position is 0040326F there the value should be 10; otherwise we would leave the subroutine without success. In our case the value is always 2. I could not resolve which subroutine is writing 10 into the memory at the position specified by EBX+8. I therefore just patched the value always to 10.

Therefore the correct login should look like this:

```
> ?login $1$KZLPLKdf$unencrypted-MD5-password
```

Returning back to subroutine 0040D611 at position 00405D65D we check if both complete (Part 1 to 3) are the same.

After having patching the value to 10 at 0040326F and setting EAX to 0 (authentication passed) at 0040D65D we are able to login. See below:

```
> ?login $1$KZLPLKdf
<fiKWrNkog> analyst logged in
```

I was now able to execute all other commands. Details can be found in A.2.4 and the description of the commands in A.2.5. Interesting was further the “?md5p” command, which sets the MD5 password and salt. See below:

```
> ?md5p
<HBislCB1j> ?md5p <pass> <salt>

> ?md5p passwd salt
<HBislCB1j> ?md5p: $1$salt$XsMd08sxGRHdyFYPZh/w01
```

After I was able to login I thought that I can also send commands over the backdoor, but I could not get interactive with the backdoor. Analyzing the code I could see that in msrll.0040BCDD, see Figure 17, the #: prompt gets send and a “%s connect from %s” should also be send, but the 2nd part was never listed. I could not figure out what the problem really was.

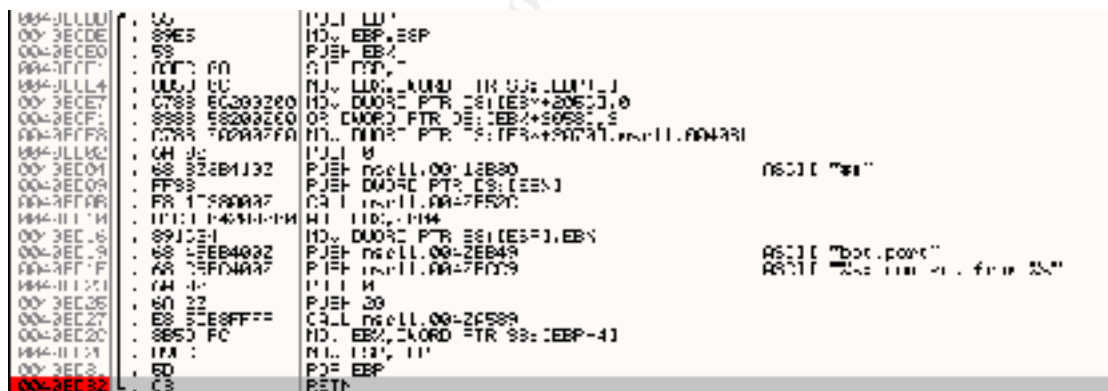


Figure 17: Subroutine 0040BCDD

Further interesting was also to check where msrll.exe creates and writes parameters into the jtram.conf file. I found it in subroutine msrll.00409D82, see Figure 18. Each time msrll.exe is run the jtram.conf file is newly created. This happens at the beginning of the subroutine. Afterwards several parameters are encrypted on a strange way.

First at 00409DE4, the parameters are read out of the memory (Arg1) and then together with Arg2 encrypted in a loop, who writes three characters per round, see A.2.3. The result is never the same even so the parameters are always the same. Arg2 is for the first parameter set to an initial value of collective7.zxy0.com. Afterwards it is always the outcome (cipher) of the previous parameter.

5 ANALYSIS WRAP-UP

Summary: From the behavioral analysis I figured out that the malware msrll.exe removes its original location and copies itself in the c:\windows\system32\mfm\ directory. It installs msrll.exe as service called “RLL enhanced driver” and tries to connect to collective7.zxy0.com on port 6667, 9999 and 8080. This server is expected to be an IRC server. The malware connects itself with a random user and nick name on the #mils channel. The malware opens further a backdoor on port tcp/2200.

From the code analysis I figured out that the malware has several dDOS functions, such as tcp-syn, icmp, udp, jolt and smurf attack mode. It further has several control and information commands, such as ?si, ?wget, ?md5p, etc. Therefore the malware is a classical bot. To use these commands the user has to first authenticate by the login command “?login \$1\$<salt>\$<MD5 hashed password>”. The initial values are “KZLPLKDF” for the salt and “W8kl8Jr1X8DOHZsmlp9qq0” for the MD5 hashed password. The controller can retrieve files from the infected system by IRC DCC (direct client connection).

I further saw that the jtram.conf file is each time newly created. Even so the parameters are the same the ciphers vary each time, due to the encryption algorithm.

Who would use this program: An evil person who wants to control a Windows system and who wants to launch from this machine dDOS attacks.

Web Research: By searching the Internet I found the following postings, which could be the same or a similar malware:

Trendmicro:	BKDR_TOMETA.A	(Sept 9, 2004)
Sophos:	Troj/Tometa-A	(June 11, 2004)
Trendmicro:	BKDR_JTRAM.A	(Jan 28, 2004)

Removing: To remove the malware from an infected system the following steps have to be taken:

1. Remove “RLL enhanced drive” service from service.msc by deleting the following registry value and keys:
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm
2. Remove c:\windows\system32\mfm directory including its files.

Prevention: A preventive mechanism would be to block the outgoing ports tcp/6667, tcp/9999 and tcp/8080 on your host-based or Internet firewall or at least monitor these ports to detect infected systems. A possible IDS signature could check for outgoing IRC connection on the channel #mils and for incoming telnet connections on port tcp/2200.

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APPENDIX A

A.1 Behavioral Analysis

A.1.1 RegShot Compare before 1st Reboot

```
REGSHOT LOG 1.61e5
Comments:
Datetime:2004/11/8 13:01:33 , 2004/11/8 13:06:09
Computer:PARIS , PARIS
Username: ,

-----
Keys deleted:1
-----
HKEY_USERS\...\Internet Settings\5.0\Cache\Extensible Cache\MSHist012004112020041121

-----
Keys added:5
-----
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm\Security
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mfm
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mfm\Security
HKEY_USERS\...\Internet Settings\5.0\Cache\Extensible Cache\MSHist012004110820041109

-----
Values deleted:6
-----
HKEY_USERS\...\Explorer\RecentDocs\Folder\7: 41 00 6E ... 00 00
HKEY_USERS\...\Internet Settings\5.0\Cache\Extensible Cache\MSHist012004112020041121\CachePath:
"%USERPROFILE%\Local Settings\History\History.IE5\MSHist012004112020041121\"
...
HKEY_USERS\...\Internet Settings\5.0\Cache\Extensible Cache\MSHist012004112020041121\CacheRepair:
0x00000000

-----
Values added:25
-----
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm\Security\Security: 01 00 ... 00 00
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm\Type: 0x00000120
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm\Start: 0x00000002
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm\ErrorControl: 0x00000002
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm\ImagePath:
"C:\WINDOWS\System32\mfm\msrll.exe"
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm\DisplayName: "Rll enhanced drive"
HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\Services\mfm\ObjectName: "LocalSystem"
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mfm\Security\Security: 01 00 ... 00 00
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mfm\Type: 0x00000120
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mfm\Start: 0x00000002
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mfm\ErrorControl: 0x00000002
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mfm\ImagePath:
"C:\WINDOWS\System32\mfm\msrll.exe"
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mfm\DisplayName: "Rll enhanced drive"
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\mfm\ObjectName: "LocalSystem"
...
HKEY_USERS\...\Internet Settings\5.0\Cache\Extensible Cache\MSHist012004110820041109\CacheRepair:
0x00000000

-----
Values modified:11
-----
HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Cryptography\ RNG\Seed: BF 96 ... 87 FC
...
HKEY_USERS\...\Explorer\UserAssist\{75048700-EF1F-11D0-9888-006097DEACF9}\Count\HRZR_EHACNGU:
P:\FNAF2004\cebprkc.rkr: 07 00 00 00 07 00 00 00 50 4E 23 83 93 C5 C4 01

-----
Files added:6
-----
C:\Documents and Settings\Administrator\Local Settings\History\History.IE5\MSHist012004110820041109\index.dat
C:\Documents and Settings\Administrator\Local Settings\Temp\Perflib_Perfdata_454.dat
```

```
C:\WINDOWS\Prefetch\MSRLL.EXE-03966588.pf
C:\WINDOWS\Prefetch\MSRLL.EXE-3340F6CB.pf
C:\WINDOWS\system32\mfmm\jtram.conf
C:\WINDOWS\system32\mfmm\msrll.exe
```

Files deleted:3

```
C:\Documents and Settings\Administrator\Desktop\msrll.exe
C:\Documents and Settings\Administrator\Local Settings\History\History.IE5\MSHist012004112020041121\index.dat
C:\Documents and Settings\Administrator\Local Settings\Temp\Perflib_Perfdata_29c.dat
```

Files [attributes?] modified:7

```
C:\Documents and Settings\Administrator\Cookies\index.dat
C:\Documents and Settings\Administrator\Local Settings\History\History.IE5\index.dat
C:\Documents and Settings\Administrator\Local Settings\Temporary Internet Files\Content.IE5\index.dat
C:\Documents and Settings\Administrator\ntuser.dat.LOG
C:\Documents and Settings\Administrator\Recent\Analyse.lnk
C:\WINDOWS\system32\config\software.LOG
C:\WINDOWS\system32\config\system.LOG
```

Folders added:6

```
C:\Documents and Settings\Administrator\Local Settings\History\History.IE5\MSHist012004110820041109
C:\Documents and Settings\Administrator\Local Settings\History\History.IE5\MSHist012004110820041109\
C:\Documents and Settings\Administrator\Local Settings\History\History.IE5\MSHist012004110820041109\..
C:\WINDOWS\system32\mfmm
C:\WINDOWS\system32\mfmm\
C:\WINDOWS\system32\mfmm\..
```

Folders deleted:3

```
C:\Documents and Settings\Administrator\Local Settings\History\History.IE5\MSHist012004112020041121
C:\Documents and Settings\Administrator\Local Settings\History\History.IE5\MSHist012004112020041121\
C:\Documents and Settings\Administrator\Local Settings\History\History.IE5\MSHist012004112020041121\..
```

Total changes:75

A.1.2 Snort Output before 1st Reboot

```
01/05-08:11:25.714800 192.168.55.128:138 -> 192.168.55.255:138
UDP TTL:128 TOS:0x0 ID:194 IpLen:20 DgmLen:229
Len: 209
11 0E 80 7E C0 A8 37 80 00 8A 00 BB 00 00 20 46 ...~..7..... F
41 45 42 46 43 45 4A 46 44 43 41 43 41 43 41 43 AEBFCEJFDCACACAC
41 43 41 43 41 43 41 43 41 43 41 43 41 43 41 43 ACACACACACACACA.
20 46 48 45 50 46 43 45 4C 45 48 46 43 45 50 46 FHEPFCELEHFCEPF
46 46 41 43 41 43 41 43 41 43 41 43 41 43 41 43 FFACACACACACACAB
4E 00 FF 53 4D 42 25 00 00 00 00 00 00 00 00 00 N..SMB%.....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
00 00 11 00 00 21 00 00 00 00 00 00 00 00 00 00 E8 .....!.
03 00 00 00 00 00 00 00 00 00 21 00 56 00 03 00 01 .....!.V....
00 00 00 02 00 32 00 5C 4D 41 49 4C 53 4C 4F 54 .....2.\MAILSLOT
5C 42 52 4F 57 53 45 00 01 00 80 FC 0A 00 50 41 \BROWSE.....PA
52 49 53 00 00 00 00 00 03 00 00 00 00 00 05 01 RIS.....
03 10 01 00 0F 01 55 AA 00 .....U..
+++++
01/05-08:13:32.353759 192.168.55.128:137 -> 192.168.55.255:137
UDP TTL:128 TOS:0x0 ID:195 IpLen:20 DgmLen:78
```

```

Len: 58
80 81 01 10 00 01 00 00 00 00 00 20 46 4B 46 ..... FKF
46 46 43 45 4A 45 44 45 49 43 41 43 41 43 41 43 FFCEJEDEICACACAC
41 43 41 43 41 43 41 43 41 43 41 43 41 00 00 20 ACACACACACACA..
00 01 ..
=====
01/05-08:13:32.360021 ARP who-has 192.168.55.128 tell 192.168.55.1

01/05-08:13:32.363303 192.168.55.1:137 -> 192.168.55.128:137
UDP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:90 DF
Len: 70
80 81 85 80 00 00 01 00 00 00 00 20 46 4B 46 ..... FKF
46 46 43 45 4A 45 44 45 49 43 41 43 41 43 41 43 FFCEJEDEICACACAC
41 43 41 43 41 43 41 43 41 43 41 43 41 00 00 20 ACACACACACACA..
00 01 00 03 F4 80 00 06 00 00 C0 A8 37 01 .....7.
=====
01/05-08:13:32.363340 ARP reply 192.168.55.128 is-at 0:50:56:E7:8B:E2
01/05-08:13:32.372447 192.168.55.1:139 -> 192.168.55.128:1049
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:48 DF
***A**S* Seq: 0xCA619596 Ack: 0x828DCAA6 Win: 0x16D0 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
=====
01/05-08:13:32.372450 192.168.55.128:1049 -> 192.168.55.1:139
TCP TTL:128 TOS:0x0 ID:196 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x828DCAA5 Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
=====
01/05-08:13:32.398896 192.168.55.1:139 -> 192.168.55.128:1049
TCP TTL:64 TOS:0x0 ID:62554 IpLen:20 DgmLen:40 DF
***A**** Seq: 0xCA619597 Ack: 0x828DCAEE Win: 0x16D0 TcpLen: 20
=====
01/05-08:13:32.398989 192.168.55.128:1049 -> 192.168.55.1:139
TCP TTL:128 TOS:0x0 ID:197 IpLen:20 DgmLen:112 DF
***AP*** Seq: 0x828DCAA6 Ack: 0xCA619597 Win: 0x4470 TcpLen: 20
81 00 00 44 20 46 4B 46 46 46 43 45 4A 45 44 45 ...D FKFFCEJEDE
49 43 41 43 41 43 41 43 41 43 41 43 41 43 41 43 ICACACACACACACAC
41 43 41 43 41 00 20 46 41 45 42 46 43 45 4A 46 ACACA. FAEBFCEJF
44 43 41 43 41 43 41 43 41 43 41 43 41 43 41 43 DCACACACACACACAC
41 43 41 43 41 41 41 00 ACACAAA.
=====
01/05-08:13:32.998885 192.168.55.1:139 -> 192.168.55.128:1049
TCP TTL:64 TOS:0x0 ID:62555 IpLen:20 DgmLen:44 DF
***AP*** Seq: 0xCA619597 Ack: 0x828DCAEE Win: 0x16D0 TcpLen: 20
82 00 00 00 ....
=====
01/05-08:13:33.007272 192.168.55.1:139 -> 192.168.55.128:1049

```

```

TCP TTL:64 TOS:0x0 ID:62556 IpLen:20 DgmLen:40 DF
***A*** Seq: 0xCA61959B Ack: 0x828DCB77 Win: 0x1920 TcpLen: 20
=====
01/05-08:13:33.007297 192.168.55.128:1049 -> 192.168.55.1:139
TCP TTL:128 TOS:0x0 ID:198 IpLen:20 DgmLen:177 DF
***AP*** Seq: 0x828DCAEE Ack: 0xCA61959B Win: 0x446C TcpLen: 20
00 00 00 85 FF 53 4D 42 72 00 00 00 00 18 53 C8 .....SMBr.....S.
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 FF FE .....
00 00 00 00 00 62 00 02 50 43 20 4E 45 54 57 4F .....b..PC NETWO
52 4B 20 50 52 4F 47 52 41 4D 20 31 2E 30 00 02 RK PROGRAM 1.0..
4C 41 4E 4D 41 4E 31 2E 30 00 02 57 69 6E 64 6F LANMAN1.0..Windo
77 73 20 66 6F 72 20 57 6F 72 6B 67 72 6F 75 70 ws for Workgroup
73 20 33 2E 31 61 00 02 4C 4D 31 2E 32 58 30 30 s 3.1a..LM1.2X00
32 00 02 4C 41 4E 4D 41 4E 32 2E 31 00 02 4E 54 2..LANMAN2.1..NT
20 4C 4D 20 30 2E 31 32 00 LM 0.12.

```

A.1.3 TDIMon Logs

```

1 0.00000000 msrll.exe:956 80D35630IRP_MJ_CREATE
TCP:0.0.0.0:2200 SUCCESS Address Open

2 0.00570659 msrll.exe:956 80D35630
TDI_SET_EVENT_HANDLER TCP:0.0.0.0:2200 SUCCESS
Error Event

3 0.00661341 msrll.exe:956 80D35630
TDI_SET_EVENT_HANDLER TCP:0.0.0.0:2200 SUCCESS
Disconnect Event

4 0.00674331 msrll.exe:956 80D35630
TDI_SET_EVENT_HANDLER TCP:0.0.0.0:2200 SUCCESS
Receive Event

...

50 81.41424024 msrll.exe:956 80D35630
TDI_SET_EVENT_HANDLER TCP:0.0.0.0:2200 SUCCESS
Chained Receive Event: NULL

51 81.41433914 msrll.exe:956 80D35630IRP_MJ_CLEANUP
TCP:0.0.0.0:2200 SUCCESS

```

A.1.4 Snort Output after 1st Reboot

```

11/20-10:50:18.009460 192.168.55.129:1026 -> 192.168.55.1:53
UDP TTL:128 TOS:0x0 ID:22 IpLen:20 DgmLen:66
Len: 46
00 02 01 00 00 01 00 00 00 00 00 00 0B 63 6F 6C .....col
6C 65 63 74 69 76 65 37 04 7A 78 79 30 03 63 6F lective7.zxy0.co
6D 00 00 01 00 01 m.....
=====
11/20-10:50:18.009458 192.168.55.1 -> 192.168.55.129
ICMP TTL:64 TOS:0xC0 ID:27093 IpLen:20 DgmLen:94
Type:3 Code:3 DESTINATION UNREACHABLE: PORT UNREACHABLE

```

```

** ORIGINAL DATAGRAM DUMP:
192.168.55.129:1026 -> 192.168.55.1:53
UDP TTL:128 TOS:0x0 ID:22 IpLen:20 DgmLen:66
Len: 46
** END OF DUMP
00 00 00 00 45 00 00 42 00 16 00 00 80 11 4A C2   ....E..B.....J.
C0 A8 37 81 C0 A8 37 01 04 02 00 35 00 2E 73 C5   ..7...7....5..s.
00 02 01 00 00 01 00 00 00 00 00 0B 63 6F 6C   .....col
6C 65 63 74 69 76 65 37 04 7A 78 79 30 03 63 6F   lective7.zxy0.co
6D 00 00 01 00 01                                     m.....

```

A.1.5 Snort Output SYN to TCP/6667

```

11/20-11:39:48.927110 192.168.55.129:1034 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:168 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x3749072A Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
=====
11/20-11:39:48.946140 192.168.55.130:6667 -> 192.168.55.129:1034
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF
***A*R** Seq: 0x0 Ack: 0x3749072B Win: 0x0 TcpLen: 20
=====
11/20-11:39:49.451034 192.168.55.129:1034 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:169 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x3749072A Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
=====
11/20-11:39:49.451664 192.168.55.130:6667 -> 192.168.55.129:1034
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF
***A*R** Seq: 0x0 Ack: 0x3749072B Win: 0x0 TcpLen: 20
=====
11/20-11:39:49.948413 192.168.55.129:1034 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:170 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x3749072A Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
=====
11/20-11:39:49.949096 192.168.55.130:6667 -> 192.168.55.129:1034
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF
***A*R** Seq: 0x0 Ack: 0x3749072B Win: 0x0 TcpLen: 20
=====
11/20-11:40:19.967210 192.168.55.129:1035 -> 192.168.55.130:9999
TCP TTL:128 TOS:0x0 ID:171 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x37C06702 Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
=====
11/20-11:40:19.977226 192.168.55.130:9999 -> 192.168.55.129:1035
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF

```

```
***A*R** Seq: 0x0 Ack: 0x37C06703 Win: 0x0 TcpLen: 20
====
11/20-11:40:20.450844 192.168.55.129:1035 -> 192.168.55.130:9999
TCP TTL:128 TOS:0x0 ID:172 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x37C06702 Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
====
11/20-11:40:20.451484 192.168.55.130:9999 -> 192.168.55.129:1035
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF
***A*R** Seq: 0x0 Ack: 0x37C06703 Win: 0x0 TcpLen: 20
====
11/20-11:40:20.949769 192.168.55.129:1035 -> 192.168.55.130:9999
TCP TTL:128 TOS:0x0 ID:173 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x37C06702 Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
====
11/20-11:40:20.950438 192.168.55.130:9999 -> 192.168.55.129:1035
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF
***A*R** Seq: 0x0 Ack: 0x37C06703 Win: 0x0 TcpLen: 20
====
11/20-11:40:50.957590 192.168.55.129:1036 -> 192.168.55.130:8080
TCP TTL:128 TOS:0x0 ID:174 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x38378BF5 Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
====
11/20-11:40:50.958477 192.168.55.130:8080 -> 192.168.55.129:1036
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF
***A*R** Seq: 0x0 Ack: 0x38378BF6 Win: 0x0 TcpLen: 20
====
11/20-11:40:51.450089 192.168.55.129:1036 -> 192.168.55.130:8080
TCP TTL:128 TOS:0x0 ID:175 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x38378BF5 Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
====
11/20-11:40:51.450793 192.168.55.130:8080 -> 192.168.55.129:1036
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF
***A*R** Seq: 0x0 Ack: 0x38378BF6 Win: 0x0 TcpLen: 20
====
11/20-11:40:51.950156 192.168.55.129:1036 -> 192.168.55.130:8080
TCP TTL:128 TOS:0x0 ID:176 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x38378BF5 Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
====
11/20-11:40:51.950934 192.168.55.130:8080 -> 192.168.55.129:1036
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF
***A*R** Seq: 0x0 Ack: 0x38378BF6 Win: 0x0 TcpLen: 20
```



```

=====
11/20-11:41:52.967190 192.168.55.129:1037 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:177 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x3924B02E Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
=====
11/20-11:41:52.968145 192.168.55.130:6667 -> 192.168.55.129:1037
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:40 DF
***A**R** Seq: 0x0 Ack: 0x3924B02F Win: 0x0 TcpLen: 20

```

A.1.6 Netcat on TCP/6667, 9999 and 8080 Output

```

[root@localhost root]# nc -p 6667 -l -n
USER oHgjkSmuXW localhost 0 :UnTAM
NICK HgFEOsCgED
[root@localhost root]# nc -p 9999 -l -n
USER VooTIsnIC localhost 0
:OExrVvnUfEdIBPMvDfhsEYEgXOwCzLJUOjeNYFmPnFe
NICK JhBGyCOsl
[root@localhost root]# nc -p 8080 -l -n
USER BWnpzVpjkQNzV localhost 0
:BEapYoxBBtCZeTuOcAOWeEfLLvrNMLRxOER
NICK lxzVdYVYPah

```

A.1.7 Snort Output msrll.exe Connects to IRCd

```

11/20-12:52:16.039351 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:425 IpLen:20 DgmLen:48 DF
*****S* Seq: 0x784336F8 Ack: 0x0 Win: 0x4000 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
=====
11/20-12:52:16.039544 192.168.55.130:6667 -> 192.168.55.129:1100
TCP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:48 DF
***A**S* Seq: 0xDDD38ECF Ack: 0x784336F9 Win: 0x16D0 TcpLen: 28
TCP Options (4) => MSS: 1460 NOP NOP SackOK
=====
11/20-12:52:16.051552 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:426 IpLen:20 DgmLen:40 DF
***A**** Seq: 0x784336F9 Ack: 0xDDD38ED0 Win: 0x4470 TcpLen: 20
=====
11/20-12:52:16.133516 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:427 IpLen:20 DgmLen:108 DF
***AP*** Seq: 0x784336F9 Ack: 0xDDD38ED0 Win: 0x4470 TcpLen: 20
55 53 45 52 20 7A 76 57 49 6E 4D 46 78 51 20 6C USER zvwInMFxQ 1
6F 63 61 6C 68 6F 73 74 20 30 20 3A 75 56 7A 6F ocalhost 0 :uVzo
75 4D 4D 53 55 61 7A 58 54 78 6A 4C 76 73 77 71 uMMSUazXTxjLvswq
64 4B 0A 4E 49 43 4B 20 6D 78 64 56 44 57 71 41 dK.NICK mxdVDWqA

```

```

6D 59 41 0A                                     mYA.
=====
11/20-12:52:16.133636 192.168.55.130:6667 -> 192.168.55.129:1100
TCP TTL:64 TOS:0x0 ID:35244 IpLen:20 DgmLen:40 DF
***A*** Seq: 0xDDD38ED0 Ack: 0x7843373D Win: 0x16D0 TcpLen: 20
=====
11/20-12:52:16.088025 192.168.55.130:6667 -> 192.168.55.129:1100
TCP TTL:64 TOS:0x0 ID:35245 IpLen:20 DgmLen:86 DF
***AP*** Seq: 0xDDD38ED0 Ack: 0x7843373D Win: 0x16D0 TcpLen: 20
4E 4F 54 49 43 45 20 41 55 54 48 20 3A 2A 2A 2A NOTICE AUTH :***
20 4C 6F 6F 6B 69 6E 67 20 75 70 20 79 6F 75 72 Looking up your
20 68 6F 73 74 6E 61 6D 65 2E 2E 2E 0D 0A hostname.....
=====
11/20-12:52:16.088841 192.168.55.130:1025 -> 192.168.55.1:53
UDP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:73 DF
Len: 53
31 20 01 00 00 01 00 00 00 00 00 03 31 32 39 1 .....129
02 35 35 03 31 36 38 03 31 39 32 07 69 6E 2D 61 .55.168.192.in-a
64 64 72 04 61 72 70 61 00 00 0C 00 01 ddr.arpa.....
=====
11/20-12:52:16.088915 192.168.55.1 -> 192.168.55.130
ICMP TTL:64 TOS:0xC0 ID:14305 IpLen:20 DgmLen:101
Type:3 Code:3 DESTINATION UNREACHABLE: PORT UNREACHABLE
** ORIGINAL DATAGRAM DUMP:
192.168.55.130:1025 -> 192.168.55.1:53
UDP TTL:64 TOS:0x0 ID:0 IpLen:20 DgmLen:73 DF
Len: 53
** END OF DUMP
00 00 00 00 45 00 00 49 00 00 40 00 40 11 4A D0 ...E..I..@.J.
C0 A8 37 82 C0 A8 37 01 04 01 00 35 00 35 54 30 ..7...7...5.5T0
31 20 01 00 00 01 00 00 00 00 00 03 31 32 39 1 .....129
02 35 35 03 31 36 38 03 31 39 32 07 69 6E 2D 61 .55.168.192.in-a
64 64 72 04 61 72 70 61 00 00 0C 00 01 ddr.arpa.....
=====
11/20-12:52:16.089076 192.168.55.130:1036 -> 192.168.55.129:113
TCP TTL:64 TOS:0x0 ID:13431 IpLen:20 DgmLen:60 DF
*****S* Seq: 0xDE023308 Ack: 0x0 Win: 0x16D0 TcpLen: 40
TCP Options (5) => MSS: 1460 SackOK TS: 1640319 0 NOP WS: 0
=====
11/20-12:52:16.108402 192.168.55.129:113 -> 192.168.55.130:1036
TCP TTL:128 TOS:0x0 ID:428 IpLen:20 DgmLen:64 DF
***A**S* Seq: 0x7844D85E Ack: 0xDE023309 Win: 0x4470 TcpLen: 44
TCP Options (9) => MSS: 1460 NOP WS: 0 NOP NOP TS: 0 0 NOP NOP SackOK
=====
IRC server tries to identify user TCP/113 process
=====

```

```

11/20-12:52:16.368789 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:432 IpLen:20 DgmLen:40 DF
***A*** Seq: 0x7843373D Ack: 0xDDD38EFE Win: 0x4442 TcpLen: 20
=====
11/20-12:52:16.369299 192.168.55.130:6667 -> 192.168.55.129:1100
TCP TTL:64 TOS:0x0 ID:35246 IpLen:20 DgmLen:110 DF
***AP*** Seq: 0xDDD38EFE Ack: 0x7843373D Win: 0x16D0 TcpLen: 20
4E 4F 54 49 43 45 20 41 55 54 48 20 3A 2A 2A 2A NOTICE AUTH :***
20 43 68 65 63 6B 69 6E 67 20 49 64 65 6E 74 0D Checking Ident.
0A 4E 4F 54 49 43 45 20 41 55 54 48 20 3A 2A 2A .NOTICE AUTH :**
2A 20 47 6F 74 20 49 64 65 6E 74 20 72 65 73 70 * Got Ident resp
6F 6E 73 65 0D 0A onse..
=====
11/20-12:52:16.601203 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:433 IpLen:20 DgmLen:40 DF
***A*** Seq: 0x7843373D Ack: 0xDDD38F44 Win: 0x43FC TcpLen: 20
=====
11/20-12:52:42.847748 192.168.55.130:6667 -> 192.168.55.129:1100
TCP TTL:64 TOS:0x0 ID:35247 IpLen:20 DgmLen:89 DF
***AP*** Seq: 0xDDD38F44 Ack: 0x7843373D Win: 0x16D0 TcpLen: 20
4E 4F 54 49 43 45 20 41 55 54 48 20 3A 2A 2A 2A NOTICE AUTH :***
20 43 6F 75 6C 64 6E 27 74 20 6C 6F 6F 6B 20 75 Couldn't look u
70 20 79 6F 75 72 20 68 6F 73 74 6E 61 6D 65 0D p your hostname.
0A .
=====
11/20-12:52:42.998768 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:434 IpLen:20 DgmLen:40 DF
***A*** Seq: 0x7843373D Ack: 0xDDD38F75 Win: 0x43CB TcpLen: 20
=====
11/20-12:52:43.478074 192.168.55.130:6667 -> 192.168.55.129:1100
TCP TTL:64 TOS:0x0 ID:35248 IpLen:20 DgmLen:1064 DF
***AP*** Seq: 0xDDD38F75 Ack: 0x7843373D Win: 0x16D0 TcpLen: 20
3A 6C 6F 63 61 6C 68 6F 73 74 2E 6C 6F 63 61 6C :localhost.local
64 6F 6D 61 69 6E 20 30 30 31 20 6D 78 64 56 44 domain 001 mxdVD
57 71 41 6D 20 3A 57 65 6C 63 6F 6D 65 20 74 6F WqAm :Welcome to
20 74 68 65 20 49 6E 74 65 72 6E 65 74 20 52 65 the Internet Re
6C 61 79 20 4E 65 74 77 6F 72 6B 20 6D 78 64 56 lay Network mxdV
44 57 71 41 6D 0D 0A 3A 6C 6F 63 61 6C 68 6F 73 DWqAm.:localhos
74 2E 6C 6F 63 61 6C 64 6F 6D 61 69 6E 20 30 30 t.localdomain 00
32 20 6D 78 64 56 44 57 71 41 6D 20 3A 59 6F 75 2 mxdVDWqAm :You
72 20 68 6F 73 74 20 69 73 20 6C 6F 63 61 6C 68 r host is localh
6F 73 74 2E 6C 6F 63 61 6C 64 6F 6D 61 69 6E 5B ost.localdomain[
6C 6F 63 61 6C 68 6F 73 74 2E 6C 6F 63 61 6C 64 localhost.locald
6F 6D 61 69 6E 2F 36 36 36 37 5D 2C 20 72 75 6E omain/6667], run
6E 69 6E 67 20 76 65 72 73 69 6F 6E 20 32 2E 38 ning version 2.8
2F 68 79 62 72 69 64 2D 36 2E 33 2E 31 0D 0A 4E /hybrid-6.3.1..N

```

4F 54 49 43 45 20 6D 78 64 56 44 57 71 41 6D 20 OTICE mxdVDWqAm
3A 2A 2A 2A 20 59 6F 75 72 20 68 6F 73 74 20 69 :*** Your host i
73 20 6C 6F 63 61 6C 68 6F 73 74 2E 6C 6F 63 61 s localhost.loca
6C 64 6F 6D 61 69 6E 5B 6C 6F 63 61 6C 68 6F 73 ldomain[localhos
74 2E 6C 6F 63 61 6C 64 6F 6D 61 69 6E 2F 36 36 t.localdomain/66
36 37 5D 2C 20 72 75 6E 6E 69 6E 67 20 76 65 72 67], running ver
73 69 6F 6E 20 32 2E 38 2F 68 79 62 72 69 64 2D sion 2.8/hybrid-
36 2E 33 2E 31 0D 0A 3A 6C 6F 63 61 6C 68 6F 73 6.3.1.:localhos
74 2E 6C 6F 63 61 6C 64 6F 6D 61 69 6E 20 30 30 t.localdomain 00
33 20 6D 78 64 56 44 57 71 41 6D 20 3A 54 68 69 3 mxdVDWqAm :Thi
73 20 73 65 72 76 65 72 20 77 61 73 20 63 72 65 s server was cre
61 74 65 64 20 54 75 65 20 4A 75 6E 20 34 20 32 ated Tue Jun 4 2
30 30 32 20 61 74 20 31 36 3A 35 39 3A 34 35 20 002 at 16:59:45
45 44 54 0D 0A 3A 6C 6F 63 61 6C 68 6F 73 74 2E EDT.:localhost.
6C 6F 63 61 6C 64 6F 6D 61 69 6E 20 30 30 34 20 localdomain 004
6D 78 64 56 44 57 71 41 6D 20 6C 6F 63 61 6C 68 mxdVDWqAm localh
6F 73 74 2E 6C 6F 63 61 6C 64 6F 6D 61 69 6E 20 ost.localdomain
32 2E 38 2F 68 79 62 72 69 64 2D 36 2E 33 2E 31 2.8/hybrid-6.3.1
20 6F 4F 69 77 73 7A 63 72 6B 66 79 64 6E 78 62 oOiwsczcrkfydnxb
20 62 69 6B 6C 6D 6E 6F 70 73 74 76 65 0D 0A 3A biklmnopstve.:
6C 6F 63 61 6C 68 6F 73 74 2E 6C 6F 63 61 6C 64 localhost.locald
6F 6D 61 69 6E 20 30 30 35 20 6D 78 64 56 44 57 omain 005 mxdVDW
71 41 6D 20 57 41 4C 4C 43 48 4F 50 53 20 50 52 qAm WALLCHOPS PR
45 46 49 58 3D 28 6F 76 29 40 2B 20 43 48 41 4E EFIX=(ov)+ CHAN
54 59 50 45 53 3D 23 26 20 4D 41 58 43 48 41 4E TYPES=#& MAXCHAN
4E 45 4C 53 3D 32 30 20 4D 41 58 42 41 4E 53 3D NELS=20 MAXBANS=
32 35 20 4E 49 43 4B 4C 45 4E 3D 39 20 54 4F 50 25 NICKLEN=9 TOP
49 43 4C 45 4E 3D 31 32 30 20 4B 49 43 4B 4C 45 ICLEN=120 KICKLE
4E 3D 39 30 20 4E 45 54 57 4F 52 4B 3D 45 46 6E N=90 NETWORK=EFn
65 74 20 43 48 41 4E 4D 4F 44 45 53 3D 62 2C 6B et CHANMODES=b,k
2C 6C 2C 69 6D 6E 70 73 74 20 4D 4F 44 45 53 3D ,l,imnpst MODES=
34 20 3A 61 72 65 20 73 75 70 70 6F 72 74 65 64 4 :are supported
20 62 79 20 74 68 69 73 20 73 65 72 76 65 72 0D by this server.
0A 3A 6C 6F 63 61 6C 68 6F 73 74 2E 6C 6F 63 61 .:localhost.loca
6C 64 6F 6D 61 69 6E 20 32 35 31 20 6D 78 64 56 ldomain 251 mxdV
44 57 71 41 6D 20 3A 54 68 65 72 65 20 61 72 65 DWqAm :There are
20 30 20 75 73 65 72 73 20 61 6E 64 20 32 20 69 0 users and 2 i
6E 76 69 73 69 62 6C 65 20 6F 6E 20 31 20 73 65 nvisible on 1 se
72 76 65 72 73 0D 0A 3A 6C 6F 63 61 6C 68 6F 73 rvers.:localhos
74 2E 6C 6F 63 61 6C 64 6F 6D 61 69 6E 20 32 35 t.localdomain 25
35 20 6D 78 64 56 44 57 71 41 6D 20 3A 49 20 68 5 mxdVDWqAm :I h
61 76 65 20 32 20 63 6C 69 65 6E 74 73 20 61 6E ave 2 clients an
64 20 30 20 73 65 72 76 65 72 73 0D 0A 3A 6C 6F d 0 servers.:lo
63 61 6C 68 6F 73 74 2E 6C 6F 63 61 6C 64 6F 6D calhost.localdom
61 69 6E 20 32 36 35 20 6D 78 64 56 44 57 71 41 ain 265 mxdVDWqA
6D 20 3A 43 75 72 72 65 6E 74 20 6C 6F 63 61 6C m :Current local

```

20 20 75 73 65 72 73 3A 20 32 20 20 4D 61 78 3A      users: 2 Max:
20 32 0D 0A 3A 6C 6F 63 61 6C 68 6F 73 74 2E 6C    2..:localhost.1
6F 63 61 6C 64 6F 6D 61 69 6E 20 32 36 36 20 6D   ocaldomain 266 m
78 64 56 44 57 71 41 6D 20 3A 43 75 72 72 65 6E   xdVDWqAm :Curren
==+++++==
11/20-12:52:43.497598 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:435 IpLen:20 DgmLen:59 DF
***AP*** Seq: 0x7843373D Ack: 0xDDD39375 Win: 0x3FCB TcpLen: 20
55 53 45 52 48 4F 53 54 20 6D 78 64 56 44 57 71   USERHOST mxdVDWq
41 6D 0A                                           Am.
==+++++==
11/20-12:52:43.498165 192.168.55.130:6667 -> 192.168.55.129:1100
TCP TTL:64 TOS:0x0 ID:35249 IpLen:20 DgmLen:443 DF
***AP*** Seq: 0xDDD39375 Ack: 0x78433750 Win: 0x16D0 TcpLen: 20
74 20 67 6C 6F 62 61 6C 20 75 73 65 72 73 3A 20   t global users:
32 20 20 4D 61 78 3A 20 32 0D 0A 3A 6C 6F 63 61    2 Max: 2..:loca
6C 68 6F 73 74 2E 6C 6F 63 61 6C 64 6F 6D 61 69   hhost.localdomai
6E 20 32 35 30 20 6D 78 64 56 44 57 71 41 6D 20   n 250 mxdVDWqAm
3A 48 69 67 68 65 73 74 20 63 6F 6E 6E 65 63 74   :Highest connect
69 6F 6E 20 63 6F 75 6E 74 3A 20 31 20 28 31 20   ion count: 1 (1
63 6C 69 65 6E 74 73 29 20 28 32 20 73 69 6E 63   clients) (2 sinc
65 20 73 65 72 76 65 72 20 77 61 73 20 28 72 65   e server was (re
29 73 74 61 72 74 65 64 29 0D 0A 3A 6C 6F 63 61   )started)..:loca
6C 68 6F 73 74 2E 6C 6F 63 61 6C 64 6F 6D 61 69   hhost.localdomai
6E 20 33 37 35 20 6D 78 64 56 44 57 71 41 6D 20   n 375 mxdVDWqAm
3A 2D 20 6C 6F 63 61 6C 68 6F 73 74 2E 6C 6F 63   :- localhost.loc
61 6C 64 6F 6D 61 69 6E 20 4D 65 73 73 61 67 65   aldomain Message
20 6F 66 20 74 68 65 20 44 61 79 20 2D 20 0D 0A   of the Day - ..
3A 6C 6F 63 61 6C 68 6F 73 74 2E 6C 6F 63 61 6C   :localhost.local
64 6F 6D 61 69 6E 20 33 37 32 20 6D 78 64 56 44   domain 372 mxdVD
57 71 41 6D 20 3A 2D 20 54 68 69 73 20 69 73 20   WqAm :- This is
61 6E 20 49 52 43 20 73 65 72 76 65 72 2E 20 41   an IRC server. A
75 74 68 6F 72 69 7A 65 64 20 75 73 65 72 73 20   uthorized users
6F 6E 6C 79 2E 0D 0A 3A 6C 6F 63 61 6C 68 6F 73   only...:localhos
74 2E 6C 6F 63 61 6C 64 6F 6D 61 69 6E 20 33 37   t.localdomain 37
36 20 6D 78 64 56 44 57 71 41 6D 20 3A 45 6E 64   6 mxdVDWqAm :End
20 6F 66 20 2F 4D 4F 54 44 20 63 6F 6D 6D 61 6E   of /MOTD comman
64 2E 0D 0A 3A 6D 78 64 56 44 57 71 41 6D 20 4D   d...:mxdVDWqAm M
4F 44 45 20 6D 78 64 56 44 57 71 41 6D 20 3A 2B   ODE mxdVDWqAm :+
69 0D 0A                                           i..
==+++++==
11/20-12:52:43.629846 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:436 IpLen:20 DgmLen:40 DF
***A**** Seq: 0x78433750 Ack: 0xDDD39508 Win: 0x4470 TcpLen: 20
==+++++==
11/20-12:52:43.847784 192.168.55.130:6667 -> 192.168.55.129:1100

```

```

TCP TTL:64 TOS:0x0 ID:35250 IpLen:20 DgmLen:111 DF
***AP*** Seq: 0xDDD39508 Ack: 0x78433750 Win: 0x16D0 TcpLen: 20
3A 6C 6F 63 61 6C 68 6F 73 74 2E 6C 6F 63 61 6C :localhost.local
64 6F 6D 61 69 6E 20 33 30 32 20 6D 78 64 56 44 domain 302 mxdVD
57 71 41 6D 20 3A 6D 78 64 56 44 57 71 41 6D 3D WqAm :mxdVDWqAm=
2B 49 58 55 4B 40 31 39 32 2E 31 36 38 2E 35 35 +IXUK@192.168.55
2E 31 32 39 20 0D 0A .129 ..
=====
11/20-12:52:43.967605 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:437 IpLen:20 DgmLen:40 DF
***A**** Seq: 0x78433750 Ack: 0xDDD3954F Win: 0x4429 TcpLen: 20
=====
11/20-12:52:47.918865 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:438 IpLen:20 DgmLen:53 DF
***AP*** Seq: 0x78433750 Ack: 0xDDD3954F Win: 0x4429 TcpLen: 20
4A 4F 49 4E 20 23 6D 69 6C 73 20 3A 0A JOIN #mils :.
=====
11/20-12:52:47.920432 192.168.55.130:6667 -> 192.168.55.129:1100
TCP TTL:64 TOS:0x0 ID:35251 IpLen:20 DgmLen:247 DF
***AP*** Seq: 0xDDD3954F Ack: 0x7843375D Win: 0x16D0 TcpLen: 20
3A 6D 78 64 56 44 57 71 41 6D 21 49 58 55 4B 40 :mxdVDWqAm!IXUK@
31 39 32 2E 31 36 38 2E 35 35 2E 31 32 39 20 4A 192.168.55.129 J
4F 49 4E 20 3A 23 6D 69 6C 73 0D 0A 3A 6C 6F 63 OIN :#mils..:loc
61 6C 68 6F 73 74 2E 6C 6F 63 61 6C 64 6F 6D 61 alhost.localdoma
69 6E 20 4D 4F 44 45 20 23 6D 69 6C 73 20 2B 6E in MODE #mils +n
74 0D 0A 3A 6C 6F 63 61 6C 68 6F 73 74 2E 6C 6F t..:localhost.lo
63 61 6C 64 6F 6D 61 69 6E 20 33 35 33 20 6D 78 caldomain 353 mx
64 56 44 57 71 41 6D 20 3D 20 23 6D 69 6C 73 20 dVDWqAm = #mils
3A 40 6D 78 64 56 44 57 71 41 6D 20 0D 0A 3A 6C :@mxdVDWqAm ..:l
6F 63 61 6C 68 6F 73 74 2E 6C 6F 63 61 6C 64 6F ocalhost.localdo
6D 61 69 6E 20 33 36 36 20 6D 78 64 56 44 57 71 main 366 mxdVDWq
41 6D 20 23 6D 69 6C 73 20 3A 45 6E 64 20 6F 66 Am #mils :End of
20 2F 4E 41 4D 45 53 20 6C 69 73 74 2E 0D 0A /NAMES list...
=====
11/20-12:52:48.020411 192.168.55.129:1100 -> 192.168.55.130:6667
TCP TTL:128 TOS:0x0 ID:439 IpLen:20 DgmLen:40 DF
***A**** Seq: 0x7843375D Ack: 0xDDD3961E Win: 0x435A TcpLen: 20

```

A.1.8 IRC Client Output

```

*** Connecting to port 6667 of server localhost
*** Looking up your hostname...
*** Checking Ident
*** No Ident response
*** Couldn't look up your hostname
*** Welcome to the Internet Relay Network analyst
*** If you have not already done so, please read the new user information with

```

```
+ /HELP NEWUSER
*** Your host is localhost.localdomain[localhost.localdomain/6667], running
+version 2.8/hybrid-6.3.1
*** Your host is localhost.localdomain[localhost.localdomain/6667], running
+version 2.8/hybrid-6.3.1
*** This server was created Tue Jun 4 2002 at 16: 59:45 EDT
*** umodes available oIwyszcrkfydnxb, channel modes available biklmnopstve
*** WALLCHOPS PREFIX=(ov)@+ CHANTYPES=#& MAXCHANNELS=20 MAXBANS=25 NICKLEN=9
+TOPICLEN=120 KICKLEN=90 NETWORK=EFnet CHANMODES=b,k,l,impst MODES=4 are
+supported by this server
*** There are 0 users and 1 invisible on 1 servers
*** This server has 1 clients and 0 servers connected
*** Current local users: 1 Max: 1
*** Current global users: 1 Max: 1
*** Highest connection count: 1 (1 clients) (1 since server was (re)started)
*** - localhost.localdomain Message of the Day -
*** - This is an IRC server. Authorized users only.
*** Mode change "+i" for user analyst by analyst
*** Channel Users Topic
*** #mils 1
*** analyst (~root@127.0.0.1) has joined channel #mils
*** #mils 1104955089
#mils analyst H ~root@127.0.0.1 (root)
#mils ZLvNfsHWe H@ jtVO@192.168.55.128 (vyOONVHFDlvewe)
```

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A.2 Code Analysis

A.2.1 Snapshot of Commands Stored in Memory

```
003D3DA0 04 00 05 00 00 07 1C 00 3F 73 69 00 AB AB AB AB ♦.+.+.+.?si.████████
003D3DB0 AB AB AB AB EE FE EE FE 00 00 00 00 00 00 00 ██████████
003D3DC0 05 00 04 00 00 07 18 00 F0 3D 3D 00 CA 58 40 00 ♦.+.+.+.?=.███
003D3DD0 00 00 01 00 10 3E 3D 00 AB AB AB AB AB AB AB ..0.▶>=.██████████
003D3DE0 00 00 00 00 00 00 00 00 04 00 05 00 00 07 1B 00 .....♦.+.+.+.
003D3DF0 3F 73 73 6C 00 AB AB AB AB AB AB AB FE EE FE ?ssl.██████████
003D3E00 00 00 00 00 00 00 00 00 05 00 04 00 00 07 18 00 .....♦.+.+.+.
003D3E10 38 3E 3D 00 7F EA 40 00 00 00 01 00 58 3E 3D 00 8>=.0Ω0..0.X>=.
003D3E20 AB AB AB AB AB AB AB AB 00 00 00 00 00 00 00 ██████████
003D3E30 04 00 05 00 00 07 19 00 3F 63 6C 6F 6E 65 00 AB ♦.+.+.+.?clone.██
003D3E40 AB AB AB AB AB AB AB FE 00 00 00 00 00 00 00 ██████████
003D3E50 05 00 04 00 00 07 18 00 00 3E 3D 00 A2 EB 40 00 ♦.+.+.+.?>=.030.
003D3E60 00 00 01 00 A0 3E 3D 00 AB AB AB AB AB AB AB ..0.ā>=.██████████
003D3E70 00 00 00 00 00 00 00 00 04 00 05 00 00 07 18 00 .....♦.+.+.+.
003D3E80 3F 63 6C 6F 6E 65 73 00 AB AB AB AB AB AB AB ?clones.██████████
003D3E90 00 00 00 00 00 00 00 00 05 00 04 00 00 07 18 00 .....♦.+.+.+.
003D3EA0 C8 3E 3D 00 2D 58 40 00 02 00 00 00 E8 3E 3D 00 4>=.-[0.0.██>=.
003D3EB0 AB AB AB AB AB AB AB AB 00 00 00 00 00 00 00 ██████████
003D3EC0 04 00 05 00 00 07 19 00 3F 6C 6F 67 69 6E 00 AB ♦.+.+.+.?login.██
003D3ED0 AB AB AB AB AB AB AB FE 00 00 00 00 00 00 00 ██████████
003D3EE0 05 00 04 00 00 07 18 00 10 3F 3D 00 D0 58 40 00 ♦.+.+.+.?=.+0.
003D3EF0 00 00 01 00 30 3F 3D 00 AB AB AB AB AB AB AB ..0.0?=.██████████
003D3F00 00 00 00 00 00 00 00 00 04 00 05 00 00 07 18 00 .....♦.+.+.+.
003D3F10 3F 75 70 74 69 6D 65 00 AB AB AB AB AB AB AB ?uptime.██████████
003D3F20 00 00 00 00 00 00 00 00 05 00 04 00 00 07 18 00 .....♦.+.+.+.
003D3F30 58 3F 3D 00 CA 5C 40 00 00 00 01 00 78 3F 3D 00 X?=.#\0..0.x?=.
003D3F40 AB AB AB AB AB AB AB AB 00 00 00 00 00 00 00 ██████████
003D3F50 04 00 05 00 00 07 18 00 3F 72 65 62 6F 6F 74 00 ♦.+.+.+.?preboot.
003D3F60 AB AB AB AB AB AB AB AB 00 00 00 00 00 00 00 ██████████
003D3F70 05 00 04 00 00 07 18 00 A0 3F 3D 00 81 5D 40 00 ♦.+.+.+.?ā?=.ü]0.
003D3F80 00 00 01 00 C0 3F 3D 00 AB AB AB AB AB AB AB ..0.!?=.██████████
003D3F90 00 00 00 00 00 00 00 00 04 00 05 00 00 07 18 00 .....♦.+.+.+.
003D3FA0 3F 73 74 61 74 75 73 00 AB AB AB AB AB AB AB ?status.██████████
003D3FB0 00 00 00 00 00 00 00 00 05 00 04 00 00 07 18 00 .....♦.+.+.+.
003D3FC0 E8 3F 3D 00 18 59 40 00 00 00 01 00 08 40 3D 00 4?=.↑Y0..0.0@=.
003D3FD0 AB AB AB AB AB AB AB AB 00 00 00 00 00 00 00 ██████████
003D3FE0 04 00 05 00 00 07 1A 00 3F 6A 75 6D 70 00 AB AB ♦.+.+.+.?jump.██
003D3FF0 AB AB AB AB AB AB AB EE FE 00 00 00 00 00 00 00 ██████████
003D4000 05 00 04 00 00 07 18 00 30 40 3D 00 0F 67 40 00 ♦.+.+.+.?00=.#g0.
003D4010 00 00 01 00 50 40 3D 00 AB AB AB AB AB AB AB ..0.P@=.██████████
003D4020 00 00 00 00 00 00 00 00 04 00 05 00 00 07 1A 00 .....♦.+.+.+.
003D4030 3F 6E 69 63 6B 00 AB AB AB AB AB AB AB EE FE ?n lock.██████████
```

A.2.2 Subroutine 00405872



A.2.3 Subroutine 004

00412000	> 3=26	MOV CL, BYTE PTR DS:[ESI]	
00412001	3=15 3F9C-1FA	MOV ECX, WORD PTR DS:[419C9F1]	msrll.00-1A677
00412002	3=28 3c	SHR ECX, 2	
00412003	3=E6C3	MOV EBX, AL	
00412004	3=F413	MOV EAX, BYTE PTR DS:[F9A+FD41]	
00412005	3=21	MOV EBX, EBX + EBX * 0x100000000	40: to +.ecx lastec
00412006	3=1	INC ECX	
00412007	3=16	MOV EAX, BYTE PTR DS:[F9A1]	
00412008	3=16 31	MOV EBX, BYTE PTR DS:[ESI+1]	
00412009	3=2E8 34	SHR ECX, 4	
0041200A	3=17D 3C	AND ECX, 7	
0041200B	3=16D2	MOV EBX, EBX, DL	
0041200C	3=1E2 34	SHL ECX, 4	
0041200D	3=17D 3C	AND ECX, 7	
0041200E	3=112	MOV ECX, ECX * 17	
0041200F	3=1 003C4.32	MOV ECX, WORD PTR DS:[419C9E1]	
00412010	3=1F4D	MOV EAX, BYTE PTR DS:[F9A+FD41]	
00412011	3=2E	MOV EBX, BYTE PTR DS:[ECX], TL	40: to second letter
00412012	3=1	INC ECX	
00412013	3=17D 3C	MOV EAX, BYTE PTR DS:[F9A1]	
00412014	3=16 3E	MOV EBX, BYTE PTR DS:[ESI+2C]	
00412015	3=2E8 3E	SHR ECX, 6	
00412016	3=112 31	AND ECX, 11	
00412017	3=E6C3	MOV EBX, AL	
00412018	3=E6D2	MOV EBX, EDI, DL	
00412019	3=1 1414	MOV ECX, ECX * 17	
0041201A	3=1 003C4.32	MOV ECX, WORD PTR DS:[419C9E1]	
0041201B	3=E402	MOV EBX, BYTE PTR DS:[EDX+EA2]	
0041201C	3=1	MOV ECX, ECX + ECX * 0x100000000	40: to third letter
0041201D	3=1	INC ECX	
0041201E	3=46 3E	MOV EBX, BYTE PTR DS:[ESI+2C]	
0041201F	3=15 3C004108	MOV ECX, WORD PTR DS:[419C9E1]	msrll.00-1A677
00412020	3=2E0 3F	AND ECX, 0xF	
00412021	3=2C6 3E	ADD ECX, 6	
00412022	3=1 1414	MOV ECX, ECX * 17	
00412023	3=1 003C4.32	MOV ECX, WORD PTR DS:[419C9E1]	
00412024	3=2413	MOV EBX, BYTE PTR DS:[EDX+EA3]	
00412025	3=F	MOV ECX, ECX + ECX * 0x100000000	
00412026	3=1	INC ECX	
00412027	3=15 7E 03	MOV ECX, WORD PTR DS:[EBP-10], 3	
00412028	3=2D 7F	MOV ECX, WORD PTR DS:[EBP-10], 7F	
00412029	3=1	INC ECX	

A.2.4 Interacting with the Bot

```

> ?login $1$KZLPLKdf
<fiKWrNkog> analyst logged in

> ?uptime
<fiKWrNkog> sys: 06h 53m 03s bot: 01h 11m 39s

> ?status
<fiKWrNkog> service:N user:Administrator inet connection:Y contype:
Lan +reboot privs:Y

> ?hostname
<fiKWrNkog> host: paris.localdomain ip: 192.168.55.128

> ?pwd
<fiKWrNkog> C:\WINDOWS\system32\mfm

> ?dir
<fiKWrNkog> 12/24/2004 20:40 <DIR> .
<fiKWrNkog> 12/24/2004 20:40 <DIR> ..
<fiKWrNkog> 12/24/2004 23:39 1084 jtram.conf
<fiKWrNkog> 11/08/2004 20:12 1175552 msrll.exe

> ?ls
<fiKWrNkog> 12/24/2004 20:40 <DIR> .
<fiKWrNkog> 12/24/2004 20:40 <DIR> ..
<fiKWrNkog> 12/24/2004 23:39 1084 jtram.conf
<fiKWrNkog> 11/08/2004 20:12 1175552 msrll.exe

> ?ps
<fiKWrNkog> 0 [System Process]
<fiKWrNkog> 4 System
<fiKWrNkog> 364 smss.exe
<fiKWrNkog> 596 csrss.exe
<fiKWrNkog> 620 winlogon.exe
<fiKWrNkog> 664 services.exe
<fiKWrNkog> 676 lsass.exe
<fiKWrNkog> 1092 svchost.exe
<fiKWrNkog> 1280 spoolsv.exe

```

```

<fiKWrNkog> 1528 VMwareService.exe
<fiKWrNkog> 1980 explorer.exe
<fiKWrNkog> 192 VMwareTray.exe
<fiKWrNkog> 196 ctfmon.exe
<fiKWrNkog> 1848 procexp.exe
<fiKWrNkog> 748 svchost.exe
<fiKWrNkog> 1204 OLLYDBG.EXE
<fiKWrNkog> 1480 msrll.exe

> ?get jtram.conf
*** DCC SEND (jtram.conf 1084) request received from fiKWrNkog
+[192.168.55.128:51344]

> ?say hello
<fiKWrNkog> usage: ?say <target> "text"
> ?say <fiKWrNkog> "Finally"
<fiKWrNkog> said Finally to <fiKWrNkog>

> ?msg
<fiKWrNkog> usage: ?msg <target> "text"
> ?msg <fiKWrNkog> "Muy bien"
<fiKWrNkog> said Muy bien to <fiKWrNkog>

> ?nick Bush
*** fiKWrNkog is now known as Bush

> ?si
<Bush> WINXP (u:Administrator) mem:(98/191) 48% GenuineIntel Mobile
Intel(R)+Pentium(R) 4 - M CPU 1.80GHz

> ?ssl
<Bush> ?ssl: -1

> ?clone
<Bush> usage ?clone: server[:port] amount

> ?clones
<Bush> ?clones: [NETWORK|all] <die|join|part|raw|msg> <"parm"> ...

> ?jump c:

> ?pwd
<Bush> C:\WINDOWS\system32\mfms

> ?echo
<Bush> (null)

> ?op
<Bush> ?op bad args

> ?aop

> ?akick

> ?fif

> ?update
<Bush> ?update: <url> <id>

> ?sums
<Bush> msrll.exe 07b93265c372533fc18e6c0138ead8ba

> ?run c:\windows\notepad.exe
<Bush> ?run: ran ok (4027096)

> ?exec c:\windows\notepad.exe
<Bush> c:\windows\notepad.exe exited with code 1

> ?exec c:\windows\notepad.exe

> ?dcc

> ?kb
<Bush> ?kb <nick> <chan>

> ?sklist
<Bush> #1 [fd:384] collective7.zxy0.com:9999 [IRC IATH IREG ICON

```

```

RNL ] +last:5
<Bush>      |\=> [n:Bush fh:Bush!JuGuJjMeMv@192.168.55.128] (EFnet)
<Bush>      |
<Bush>      |---[#mils] (2) +tn
<Bush>      |         |-[Bush] [192.168.55.128]
<Bush>      |         |-[analyst] [127.0.0.1]

> ?unset

> ?con

> ?ping 192.168.55.130
<Bush> ?ping <ip> <total secs> <p size> <delay> [port]

> ?udp 192.168.55.130

> ?syn 192.168.55.130
<Bush> ?syn <ip> <port> <t_time> <delay>

> ?smurf 192.168.55.130
<Bush> ?smurf <ip> <p size> <duration> <delay>

> ?jolt
<Bush> ?jolt <ip> <duration> <delay>

> ?insmod
<Bush> ?insmod: <mod name>

> ?lsmode

> ?kill 1920
<Bush> pid 1920 killed

> ?copy msrll.exe c:\
<Bush> Could not copy msrll.exe to c:\

> ?del move-me.txt
<Bush> move-me.txt removed

> ?reboot
*** Signoff: Bush (Read error: 104 (Connection reset by peer))

```

A.2.5 Bot Commands Stored in Memory

Text	Comments
?si	Delivers system info of the bot, such as OS, user, memory, CPU
?ssl	Returns the ssl mode.
?clone	Clones a bot to listen to another server and port.
?clones	Lists clones.
?login	To login is required for executing any commands.
?uptime	Delivers uptime of system and the bot.
?reboot	Reboots the bot.
?status	Delivers the status of the bot. (running as a service, user, inet connection, connection type, etc)
?jump	
?nick	To change the nick of a bot.
?echo	
?hush	
?wget	Downloads a file from an url.
?join	
?op	
?aop	
?akick	
?part	
?dump	
?set	
?die	

?md5p	Change md5 password and salt value.
?free	
?raw	
?update	Bot gets a new version from url with an id.
?hostname	Delivers the hostname and IP address of the bot.
?fif	
?!fif	
?del	Deletes a file.
?pwd	Lists the current working directory of the bot.
?play	
?copy	Copies files.
?move	Moves a file.
?dir	Lists the current directory of the bot.
?sums	Takes an md5sum of the bot file.
?ls	Same as ?dir.
?cd	To change the directory of the bot.
?rmdir	Removes a directory.
?mkdir	Makes a directory.
?run	Runs any command non-visible.
?exec	Executes a command.
?ps	Lists all running system processes of the bot.
?kill	Kills a processes based on the PID on a bot.
?killall	Kills all processes on a bot.
?crash	
?dcc	
?get	Retrieves a file by DCC from the infected system.
?say	Sends a message to bot.
?msg	Same as ?say
?kb	
?sklist	Gives an overview of the bots its channels and IP addresses.
?unset	
?uattr	
?dccsk	
?con	
?ping	dDOS functionality. Send ICMP packets. Destination, duration, packet size, delay and port can be chosen.
?udp	dDOS functionality. Send UDP packets. Destination, duration, delay and port can be chosen.
?syn	dDOS functionality. Send TCP - Syn packets. Destination, duration, packet size, delay and port can be chosen.
?smurf	dDOS functionality. Smurf attack (use of forged ICMP echo request packets and the direction of packets to IP broadcast addresses). Destination, duration, packet size, delay and port can be chosen.
?jolt	dDOS functionality. The Jolt attack is designed to crash your system by sending invalid IP fragments at it. The Jolt attack sends very large, fragmented ICMP packets to a target machine running Windows 95 or NT. The ICMP packets are fragmented in such a way that the target machine is unable to reassemble them for use. Destination, duration, packet size, delay and port can be chosen.
?insmod	Inserts a module.
?rmmod	Removes a module.
?lsmod	Lists installed modules.

A.3 Configuration Files

A.3.1 IRC Server – ircd.conf

```
M:localhost.localdomain::IRC Server:
A:IRC Server:Labs:Lab Administrator
Y:1:90:0:200:100000
Y:2:90:0:10:500000
I:NOMATCH::*@*:*:1
O:127.0.0.1:GCEwqW6usMgB2:root::2
P:::9999
P:::8080
P:::6667
```

A.4 BinText Strings Output of msrll.exe

A.4.1 Aspacked msrll.exe Version

File pos	Mem pos	ID	Text
=====	=====	===	=====
0000004D	0040004D	0	!This program cannot be run in DOS mode.
00000178	00400178	0	.text
000001A0	004001A0	0	.data
000001F0	004001F0	0	.idata
00000218	00400218	0	.aspack
00000240	00400240	0	.adata
00000427	00401027	0	6>HBld
00000572	00401172	0	(jO
000006AA	004012AA	0	S'tt@
00000702	00401302	0	~MMhx
000007F0	004013F0	0	Xp,Yd
000008FD	004014FD	0	TPVTR
00000927	00401527	0	0&rgt
00000D1A	0040191A	0	Y8EoM,
00000E94	00401A94	0	gPtL7S
00000F17	00401B17	0	#u1DY
00000F8F	00401B8F	0	Syv,l
0000FCC	00401BCC	0	YQ(W;n
0000FFF	00401BFF	0	@\X~K
0000106F	00401C6F	0	,gMF
000010CE	00401CCE	0	1d%.A
00001149	00401D49	0	wmfe)

000011BC 00401DBC 0 wn*-(
 0000139E 00401F9E 0 <)li>
 0000152A 0040212A 0)<)H1
 00001646 00402246 0 Hq '7
 00001678 00402278 0 : d'V
 000016CD 004022CD 0 h=#tD
 00001729 00402329 0 UI=.Z
 000017BC 004023BC 0 3#b5pHo
 000019BF 004025BF 0 iWw+V
 00001A37 00402637 0 w3i5Y-
 00001C58 00402858 0 [u)aH=
 00001D09 00402909 0 /0mo0
 00001D1A 0040291A 0 Bj3K7%(
 00001D85 00402985 0 yb>qO
 00001E76 00402A76 0 h=&PO
 00001E7E 00402A7E 0 O7IsL
 00001F7A 00402B7A 0 s7xl:
 00002222 00402E22 0 TN9x0
 00002361 00402F61 0 U[{*^4
 000023FB 00402FFB 0 k3VgD
 000024B4 004030B4 0 m&8NRM
 000026D8 004032D8 0 k;Px,
 0000286F 0040346F 0 8e47xW
 00002947 00403547 0 x[D.-
 00002B4C 0040374C 0 H&,0d
 00002B59 00403759 0 W'A=j
 00002BC7 004037C7 0 EAe4xlpO
 00002E2D 00403A2D 0 r8cy!/
 00002EB9 00403AB9 0 127\$9v
 00002F5A 00403B5A 0 zYX[[T
 00002FBA 00403BBA 0 } {e}
 00003336 00403F36 0 PS=,sdVQ
 000033A2 00403FA2 0 UZKSU,
 00003414 00404014 0 5OUS</
 000034C4 004040C4 0 %XjBZnu
 000034DC 004040DC 0 sX_,G
 000035D4 004041D4 0 9QBDW
 00003613 00404213 0 :|gs3~3
 0000367C 0040427C 0 WN 7g
 000036FB 004042FB 0 A7Od-

000038B0	004044B0	0	cJ =H
0000397B	0040457B	0	G~+f
00003AB6	004046B6	0	s&+*uX
00003C96	00404896	0	L,HvCy
00003F2A	00404B2A	0	h~RX<
00004164	00404D64	0	wZMFN_
00004242	00404E42	0	u}> y
000042E3	00404EE3	0	\$+z_l
0000437C	00404F7C	0	T_6F+
00004394	00404F94	0	jlR=N
000043BA	00404FBA	0	55R[M
0000442A	0040502A	0	y!]zqZ
00004494	00405094	0	s\$ILIEK
000044F9	004050F9	0	pr}#
00004544	00405144	0	'.gch(
00004555	00405155	0	# dNZ
00004599	00405199	0	PQiqGt
000046C7	004052C7	0	P[{'R
00004729	00405329	0	?Q~)Qv
00004767	00405367	0	Y 5S(K
00004934	00405534	0	?v'Tz
0000498B	0040558B	0	0]2%i
00004BA7	004057A7	0	>~g[ff!Unl
00004E54	00405A54	0	xaa11K
00004E8D	00405A8D	0	fOjv.
0000515E	00405D5E	0	G /a}
00005172	00405D72	0	M1QF;
000052D5	00405ED5	0	d{fB0d
000054F8	004060F8	0	<?nxt
00005514	00406114	0	s\$OY5-
00005534	00406134	0]ruy~
0000560E	0040620E	0	h9pPE
0000564E	0040624E	0	.@g5d
0000566C	0040626C	0	s*9r'sN
00005729	00406329	0	ca7%D
00005803	00406403	0	?d]aH
00005925	00406525	0	Z3O-; ;
00005A4A	0040664A	0	0X^@
00005C56	00406856	0	fOq2f
00005CF7	004068F7	0	kvK@~G

00005E65	00406A65	0	GHWWa
00005F1E	00406B1E	0	{[3aM
00005F78	00406B78	0	/xzKX
00006253	00406E53	0	PAPD;-
00006504	00407104	0	m#]+d
00006575	00407175	0	E2#fW
000066B3	004072B3	0	icBLM
00006816	00407416	0	E'>*)
00006C1F	0040781F	0	3N@G:
00006D47	00407947	0	~/WDE
00006E3A	00407A3A	0	xCd4!c
00006E99	00407A99	0	6n O+
00006ECA	00407ACA	0	Sn)b/
000070D2	00407CD2	0	/&*Qr
00007216	00407E16	0	gmRx[
0000723E	00407E3E	0	fuQal
000073A4	00407FA4	0	M'L s
00007536	00408136	0	xq,p;j
00007604	00408204	0	bn;&%y
00007664	00408264	0	}NHvl
0000769A	0040829A	0	,UQ &
000077D3	004083D3	0	y[:BaV_
00007918	00408518	0]zl(3
000079BF	004085BF	0	E
00007A2A	0040862A	0	8qA9;
00007B41	00408741	0	aZ!zU
00007B99	00408799	0	?u%Y
00007D57	00408957	0	dqiV*
00007D88	00408988	0	~a0FG
00007D9E	0040899E	0	Yqc*Jam
00007E14	00408A14	0	q6*\
00007F18	00408B18	0	l.zxx
00008011	00408C11	0	~a Yh
000081F4	00408DF4	0	>+0ac
00008440	00413040	0	GMZid+K
00008519	00413119	0	XFt##
00008540	00413140	0	90K.P
000085CA	004131CA	0	5 RBd
00008655	00413255	0	/af=V
00008A73	0051B073	0	'Uazu

G2

00008B6F	0051B16F	0	\%Ap2
00008E7D	0051B47D	0	bl4x+Za
00008EDD	0051B4DD	0	Z/rA'
00008F72	0051B572	0	ga1YAx
00009094	0051B694	0	kN2\$6][x
000090A3	0051B6A3	0	.yw_
000090D1	0051B6D1	0	p[3bg
00009271	0051D071	0	VirtualAlloc
0000927E	0051D07E	0	VirtualFree
00009641	0051D441	0	kernel32.dll
0000964E	0051D44E	0	ExitProcess
0000965A	0051D45A	0	user32.dll
00009665	0051D465	0	MessageBoxA
00009671	0051D471	0	wsprintfA
0000967B	0051D47B	0	LOADER ERROR
00009688	0051D488	0	The procedure entry point %s could not be located in the dynamic link library %s
000096D9	0051D4D9	0	The ordinal %u could not be located in the dynamic link library %s
000098E6	0051D6E6	0	(08@P
00009A74	0051D874	0	D4 M
00009BC0	0051D9C0	0	::F,s
00009BCF	0051D9CF	0	::F0s
00009BDB	0051D9DB	0	;F4s
00009EB5	0051DCB5	0	D\$\$W3
0000A16C	0051DF6C	0	kernel32.dll
0000A17B	0051DF7B	0	GetProcAddress
0000A18C	0051DF8C	0	GetModuleHandleA
0000A19F	0051DF9F	0	LoadLibraryA
0000A274	0051E074	0	advapi32.dll
0000A281	0051E081	0	msvcrt.dll
0000A28C	0051E08C	0	msvcrt.dll
0000A297	0051E097	0	shell32.dll
0000A2A3	0051E0A3	0	user32.dll
0000A2AE	0051E0AE	0	version.dll
0000A2BA	0051E0BA	0	wininet.dll
0000A2C6	0051E0C6	0	ws2_32.dll
0000A313	0051E113	0	AdjustTokenPrivileges
0000A32B	0051E12B	0	_itoa
0000A333	0051E133	0	__getmainargs

```

0000A343 0051E143 0 ShellExecuteA
0000A353 0051E153 0 DispatchMessageA
0000A366 0051E166 0 GetFileVersionInfoA
0000A37C 0051E17C 0 InternetCloseHandle
0000A392 0051E192 0 WSAGetLastError

```

A.4.2 Unpacked msrll.exe Version

```

File pos  Mem pos  ID  Text
=====  =====  ==  ====
0000004D 0040004D 0  !This program cannot be run in DOS mode.
00000088 00400088 0  [AspackDie!]
00000178 00400178 0  .text
000001A0 004001A0 0  .data
000001F0 004001F0 0  .idata
00000218 00400218 0  .aspack
00000240 00400240 0  .adata
00001326 00401326 0  ?insmod
0000132E 0040132E 0  ?rmmod
00001335 00401335 0  ?lsmod
00001399 00401399 0  %s: <mod name>
000013A8 004013A8 0  %s: mod list full
000013BA 004013BA 0  %s: err: %u
000013C6 004013C6 0  mod_init
000013CF 004013CF 0  mod_free
000013D8 004013D8 0  %s: cannot init %s
000013EB 004013EB 0  %s: %s loaded (%u)
000013FE 004013FE 0  %s: mod already loaded
00001416 00401416 0  %s:%s err %u
000015B5 004015B5 0  %s:%s not found
000015C5 004015C5 0  %s: unloading %s
000016AE 004016AE 0  [%u]: %s hinst:%x
00001712 00401712 0  unloading %s
000017A0 004017A0 0  %s: invalid_addr: %s
000017B5 004017B5 0  %s%s [port]
000018E8 004018E8 0  finished %s
00001A40 00401A40 0  %s <ip> <port> <t_time> <delay>
00001B32 00401B32 0  sockopt: %u
00001B3E 00401B3E 0  sendto err: %u
00001B4D 00401B4D 0  sockraw: %u
00001B59 00401B59 0  syn: done

```

00001FBC	00401FBC	0	%s <ip> <duration> <delay>
00002096	00402096	0	sendto: %u
000020A2	004020A2	0	jolt2: done
00002260	00402260	0	%s <ip> <p size> <duration> <delay>
00002356	00402356	0	Err: %u
0000235E	0040235E	0	smurf done
00002567	00402567	0	PhV#@
000025DE	004025DE	0	&err: %u
00002753	00402753	0	?ping
00002763	00402763	0	?smurf
0000276A	0040276A	0	?jolt
00002820	00402820	0	PONG :%s
0000283A	0040283A	0	Oh (@
0000299D	0040299D	0	%s!%s@%s
00002B3D	00402B3D	0	%s!%s
00002BB6	00402BB6	0	SVh=+@
00002BD7	00402BD7	0	irc.nick
00002BE0	00402BE0	0	NICK %s
00002EEA	00402EEA	0	NETWORK=
00002FF8	00402FF8	0	irc.pre
000032CC	004032CC	0	__%s__
000032D2	004032D2	0	__%s__
000032D9	004032D9	0	__%s__
000032E1	004032E1	0	NICK %s
000032F0	004032F0	0	%s %s
000036B0	004036B0	0	irc.chan
00003775	00403775	0	%s %s
0000377B	0040377B	0	WHO %s
000037C8	004037C8	0	PPhV,@
00003A45	00403A45	0	USERHOST %s
00003A52	00403A52	0	logged into %(%)s as %s
00003A97	00403A97	0	<\$hE:@
00003ABB	00403ABB	0	PhR:@
00003B99	00403B99	0	nick.pre
00003BA2	00403BA2	0	%s-%04u
00003BAA	00403BAA	0	irc.user
00003BB3	00403BB3	0	irc.usereal
00003BBF	00403BBF	0	irc.real
00003BC8	00403BC8	0	irc.pass
00003BE0	00403BE0	0	trend(): connection to %s:%u failed

```
00003C20 00403C20 0 USER %s localhost 0 :%s
00003C38 00403C38 0 NICK %s
00003DF5 00403DF5 0 Ph <@
000040BF 004040BF 0 PRIVMSG
00004100 00404100 0 trecv(): Disconnected from %s err:%u
0000446B 0040446B 0 NOTICE
00004472 00404472 0 %s %s :%s
00004615 00404615 0 Ph}D@
00004711 00404711 0 MODE %s -o+b %s *@%s
00004798 00404798 0 C'PSWh
000047B4 004047B4 0 Sh'G@
000047E7 004047E7 0 MODE %s -bo %s %s
0000487B 0040487B 0 Sh'G@
00004924 00404924 0 %s.key
00004A63 00404A63 0 Ph'G@
00004AA8 00404AA8 0 sk#%u %s is dead!
00004ABA 00404ABA 0 s_check: %s dead? pinging...
00004AD7 00404AD7 0 PING :ok
00004B00 00404B00 0 s_check: send error to %s disconnecting
00004B28 00404B28 0 expect the worst
00004B39 00404B39 0 s_check: killing socket %s
00004B54 00404B54 0 irc.knick
00004B5E 00404B5E 0 jtr.%u%s.iso
00004B6B 00404B6B 0 ison %s
00004B74 00404B74 0 servers
00004B7C 00404B7C 0 s_check: trying %s
00004DAA 00404DAA 0 Ph9K@
00004ED5 00404ED5 0 PhkK@
00004F41 00404F41 0 ShtK@
00004FD8 00404FD8 0 uYVh|K@
00005052 00405052 0 %s.mode
0000505A 0040505A 0 MODE %s %s
00005078 00405078 0 ShRP@
000050DA 004050DA 0 Sh$I@
000051A8 004051A8 0 PShZP@
000055A3 004055A3 0 mode %s +o %s
000055B2 004055B2 0 akick
000055B8 004055B8 0 mode %s +b %s %s
000055CA 004055CA 0 KICK %s %s
00005760 00405760 0 irc.pre
```

00005781 00405781 0 Set an irc sock to preform %s command on
000057AB 004057AB 0 Type
000057B3 004057B3 0 %csklist
000057BC 004057BC 0 to view current sockets, then
000057DC 004057DC 0 %cdccsk
000057E4 004057E4 0 <#>
000058B4 004058B4 0 %s: dll loaded
000058C3 004058C3 0 %s: %d
0000597B 0040597B 0 RhHY@
000059C6 004059C6 0 RhHY@
000059E1 004059E1 0 said %s to %s
000059EF 004059EF 0 usage: %s <target> "text"
00005A74 00405A74 0 %s not on %s
00005A81 00405A81 0 usage: %s <nick> <chan>
00005B20 00405B20 0 %s logged in
00005B87 00405B87 0 Sh [@
00005BA2 00405BA2 0 sys: %s bot: %s
00005BB2 00405BB2 0 preformance counter not avail
00005C2B 00405C2B 0 usage: %s <cmd>
00005C3B 00405C3B 0 %s free'd
00005C45 00405C45 0 unable to free %s
00005C6F 00405C6F 0 Oh+\@
00005CAD 00405CAD 0 later!
00005CB4 00405CB4 0 unable to %s errno:%u
00005D40 00405D40 0 service:%c user:%s inet connection:%c contype:%s reboot
privs:%c
00005E09 00405E09 0 Ph@]@
00005E23 00405E23 0 %-5u %s
00005F8F 00405F8F 0 %s: %s
00005F96 00405F96 0 %s: somefile
0000603F 0040603F 0 PhHY@
000060D4 004060D4 0 host: %s ip: %s
00006269 00406269 0 capGetDriverDescriptionA
00006292 00406292 0 cpus:%u
000062A0 004062A0 0 WIN%s (u:%s)%s%s mem:(%u/%u) %u%% %s %s
000065CB 004065CB 0 %s: %s (%u)
00006708 00406708 0 %s %s
00006754 00406754 0 %s bad args
000067BC 004067BC 0 3hTg@
000067DA 004067DA 0 akick

```

000067E8 004067E8 0 %s[%u] %s
000067F2 004067F2 0 %s removed
000067FD 004067FD 0 couldnt find %s
0000680D 0040680D 0 %s added
00006816 00406816 0 %s already in list
0000682A 0040682A 0 usage: %s +/- <host>
0000696F 0040696F 0 7h*h@
000069EB 004069EB 0 jtram.conf
000069F6 004069F6 0 %s /t %s
000069FF 004069FF 0 jtr.home
00006A08 00406A08 0 %s\%s
00006A0E 00406A0E 0 %s: possibly failed: code %u
00006A2B 00406A2B 0 %s: possibly failed
00006A3F 00406A3F 0 %s: exec of %s failed err: %u
00006A90 00406A90 0 u.exf
00006C2D 00406C2D 0 Ph+j@
00006C82 00406C82 0 Ph?j@
00006CBC 00406CBC 0 jtr.id
00006CC3 00406CC3 0 %s: <url> <id>
00006ED7 00406ED7 0 IREG
00006EDD 00406EDD 0 CLON
00006EE3 00406EE3 0 ICON
00006EF8 00406EF8 0 WCON
00006F40 00406F40 0 #%u [fd:%u] %s:%u [%s%s] last:%u
00006F63 00406F63 0 |=> [n:%s fh:%s] (%s)
00006F82 00406F82 0 |--[%s] (%u) %s
00006F96 00406F96 0 | |-%s [%s] [%s]
00006FAD 00406FAD 0 |=> (%s) (%.8x)
0000716E 0040716E 0 B$PRhco@
00007360 00407360 0 %s <pass> <salt>
000073C8 004073C8 0 %s <nick> <chan>
0000748B 0040748B 0 PING %s
000074C9 004074C9 0 mIRC v6.12 Khaled Mardam-Bey
000074E7 004074E7 0 VERSION %s
0000751C 0040751C 0 dcc.pass
00007525 00407525 0 temp add %s
000075BD 004075BD 0 $h%u@
0000766A 0040766A 0 %s%u-%s
00007675 00407675 0 %s opened (%u)
000076A0 004076A0 0 %u bytes from %s in %u seconds saved to %s

```

```

000076CB 004076CB 0 (%s %s): incomplete! %u bytes
000076E9 004076E9 0 couldnt open %s err:%u
00007700 00407700 0 (%s) %s: %s
0000770C 0040770C 0 (%s) urlopen failed
00007720 00407720 0 (%s): inetopen failed
00007798 00407798 0 Whjv@
00007B9D 00407B9D 0 Ph w@
00007BE4 00407BE4 0 no file name in %s
00007DDB 00407DDB 0 %s created
00007E49 00407E49 0 %s %s to %s Ok
00007E8F 00407E8F 0 3hl~@
00007EE0 00407EE0 0 %0.2u/%0.2u/%0.2u %0.2u:%0.2u %15s %s
00007F09 00407F09 0 %s (err: %u)
0000806B 0040806B 0 ShHY@
00008085 00408085 0 err: %u
000080F8 004080F8 0 %s %s :ok
00008165 00408165 0 unable to %s %s (err: %u)
000081C3 004081C3 0 ShHY@
000081F5 004081F5 0 %-16s %s
00008200 00408200 0 %-16s (%u.%u.%u.%u)
00008489 00408489 0 [%s][%s] %s
00008595 00408595 0 closing %u [%s:%u]
000085A8 004085A8 0 unable to close socket %u
000087E2 004087E2 0 using sock #%u %s:%u (%s)
000087FD 004087FD 0 Invalid sock
0000880B 0040880B 0 usage %s <socks #>
000088D7 004088D7 0 leaves %s
000088E1 004088E1 0 :0 * * :%s
00008A96 00408A96 0 joins: %s
00008B82 00408B82 0 ACCEPT
00008B89 00408B89 0 resume
00008B90 00408B90 0 err: %u
00008B99 00408B99 0 DCC ACCEPT %s %s %s
00008BAE 00408BAE 0 dcc_resume: cant find port %s
00008BD1 00408BD1 0 dcc.dir
00008BD9 00408BD9 0 %s\%s\%s\%s
00008BE5 00408BE5 0 unable to open (%s): %u
00008BFD 00408BFD 0 resuming dcc from %s to %s
00008C19 00408C19 0 DCC RESUME %s %s %u
0000934E 0040934E 0 ?clone

```

00009355	00409355	0	?clones
0000935D	0040935D	0	?login
00009364	00409364	0	?uptime
0000936C	0040936C	0	?reboot
00009374	00409374	0	?status
0000937C	0040937C	0	?jump
00009382	00409382	0	?nick
00009388	00409388	0	?echo
0000938E	0040938E	0	?hush
00009394	00409394	0	?wget
0000939A	0040939A	0	?join
000093A9	004093A9	0	?akick
000093B0	004093B0	0	?part
000093B6	004093B6	0	?dump
000093C6	004093C6	0	?md5p
000093CC	004093CC	0	?free
000093D7	004093D7	0	?update
000093DF	004093DF	0	?hostname
000093EE	004093EE	0	?!fif
000093FE	004093FE	0	?play
00009404	00409404	0	?copy
0000940A	0040940A	0	?move
00009415	00409415	0	?sums
00009423	00409423	0	?rmdir
0000942A	0040942A	0	?mkdir
00009436	00409436	0	?exec
00009440	00409440	0	?kill
00009446	00409446	0	?killall
0000944F	0040944F	0	?crash
0000946E	0040946E	0	?sklist
00009476	00409476	0	?unset
0000947D	0040947D	0	?uattr
00009484	00409484	0	?dccsk
00009490	00409490	0	?killsk
00009499	00409499	0	VERSION*
000094AE	004094AE	0	IDENT
000096BE	004096BE	0	%ud %02uh %02um %02us
000096D4	004096D4	0	%02uh %02um %02us
000096E6	004096E6	0	%um %02us
000099E0	004099E0	0	jtram.conf

```

000099EB 004099EB 0 jtr.*
000099F5 004099F5 0 DiCHFc2ioiVmb3cb4zZ7zWZH1oM=
00009A16 00409A16 0 conf_dump: wrote %u lines
0000A270 0040A270 0 get of %s incomplete at %u bytes
0000A2B0 0040A2B0 0 get of %s completed (%u bytes), %u seconds %u cps
0000A2F0 0040A2F0 0 error while writing to %s (%u)
0000A65C 0040A65C 0 chdir: %s -> %s (%u)
0000A750 0040A750 0 dcc_wait: get of %s from %s timed out
0000A790 0040A790 0 dcc_wait: closing [#%u] %s:%u (%s)
0000A9F0 0040A9F0 0 %4s #%.2u %s %ucps %u%% [sk#%u] %s
0000AA30 0040AA30 0 %u Send(s) %u Get(s) (%u transfer(s) total) UP:%ucps
DOWN:%ucps Total:%ucps
0000AC95 0040AC95 0 PRQh0
0000ACD0 0040ACD0 0 send of %s incomplete at %u bytes
0000AD10 0040AD10 0 send of %s completed (%u bytes), %u seconds %u cps
0000AF50 0040AF50 0 cant open %s (err:%u) pwd:{%s}
0000AF70 0040AF70 0 DCC SEND %s %u %u %u
0000B751 0040B751 0 %s %s
0000B757 0040B757 0 %s exited with code %u
0000B76E 0040B76E 0 %s\%s
0000B774 0040B774 0 %s: %s
0000B77B 0040B77B 0 exec: Error:%u pwd:%s cmd:%s
0000BB40 0040BB40 0 dcc.pass
0000BB49 0040BB49 0 bot.port
0000BB52 0040BB52 0 %s bad pass from "%s" @%s
0000BCC9 0040BCC9 0 %s: connect from %s
0000BD33 0040BD33 0 jtr.bin
0000BD3B 0040BD3B 0 msrll.exe
0000BD45 0040BD45 0 jtr.home
0000BD57 0040BD57 0 jtr.id
0000BD63 0040BD63 0 irc.quit
0000BD6E 0040BD6E 0 servers
0000BD80 0040BD80 0
collective7.zxy0.com,collective7.zxy0.com:9999!,collective7.zxy0.com:8080
0000BDCA 0040BDCA 0 irc.chan
0000BDD3 0040BDD3 0 #mils
0000BDE0 0040BDE0 0 $1$KZLPLKdF$W8kl8Jr1X8DOHZsmIp9qq0
0000BE20 0040BE20 0 $1$KZLPLKdF$55isA1ITvamR7bjAdBziX.
0000C02F 0040C02F 0 SSL_get_error
0000C03D 0040C03D 0 SSL_load_error_strings

```

```

0000C054 0040C054 0 SSL_library_init
0000C065 0040C065 0 SSLv3_client_method
0000C079 0040C079 0 SSL_set_connect_state
0000C08F 0040C08F 0 SSL_CTX_new
0000C09B 0040C09B 0 SSL_new
0000C0A3 0040C0A3 0 SSL_set_fd
0000C0AE 0040C0AE 0 SSL_connect
0000C0BA 0040C0BA 0 SSL_write
0000C0C4 0040C0C4 0 SSL_read
0000C0CD 0040C0CD 0 SSL_shutdown
0000C0DA 0040C0DA 0 SSL_free
0000C0E3 0040C0E3 0 SSL_CTX_free
0000C263 0040C263 0 kernel32.dll
0000C270 0040C270 0 QueryPerformanceCounter
0000C288 0040C288 0 QueryPerformanceFrequency
0000C2A2 0040C2A2 0 RegisterServiceProcess
0000C2B9 0040C2B9 0 jtram.conf
0000C5B1 0040C5B1 0 irc.user
0000C5BA 0040C5BA 0 %s : USERID : UNIX : %s
0000C6A4 0040C6A4 0 QUIT :FUCK %u
0000C742 0040C742 0 Killed!? Arrg! [%u]
0000C756 0040C756 0 QUIT :%s
0000C7E8 0040C7E8 0 SeShutdownPrivilege
0000C888 0040C888 0 %s\s
0000C88E 0040C88E 0 %s\s\s\s
0000C897 0040C897 0 RII enhanced drive
0000C8C0 0040C8C0 0 software\microsoft\windows\currentversion\run
0000C8EE 0040C8EE 0 /d "%s"
0000CE3D 0040CE3D 0 < u&
0000D010 0040D010 0
./0123456789ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz
0000EA60 0040EA60 0 usage %s: server[:port] amount
0000EB33 0040EB33 0 %s: %s
0000EB3E 0040EB3E 0 %s %s %s <PARAM>
0000EB80 0040EB80 0 %s: [NETWORK|all] %s <"parm"> ...
0000EE20 0040EE20 0 USER %s localhost 0 :%s
0000EE38 0040EE38 0 NICK %s
0000EEE4 0040EEE4 0 PSVh
0000F140 0040F140 0 md5.c
0000F146 0040F146 0 md != NULL

```

0000F8F1	0040F8F1	0	buf != NULL
0000F99F	0040F99F	0	hash != NULL
0000FAC5	0040FAC5	0	message digest
0000FAD4	0040FAD4	0	abcdefghijklmnopqrstuvwxyz
0000FB00	0040FB00	0	ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789
0000FB40	0040FB40	0	1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890
0000FCE0	0040FCE0	0	sprng
0000FD11	0040FD11	0	sprng.c
0000FD19	0040FD19	0	buf != NULL
0000FDBC	0040FDBC	0	rc6.c
0000FDC2	0040FDC2	0	skey != NULL
0000FDCF	0040FDCF	0	key != NULL
0000FFD1	0040FFD1	0	ct != NULL
0000FFDC	0040FFDC	0	pt != NULL
0001023E	0041023E	0	#4EVgx
00010256	00410256	0	\$5FWWhy
00010282	00410282	0	#4EVgx
0001029A	0041029A	0	\$5FWWhy
000102C6	004102C6	0	#4EVgx
000102DE	004102DE	0	\$5FWWhy
000102F8	004102F8	0	gN]HU
000103C3	004103C3	0	desired_keysize != NULL
00010430	00410430	0	ctr.c
00010436	00410436	0	ctr != NULL
00010442	00410442	0	key != NULL
0001044E	0041044E	0	count != NULL
00010546	00410546	0	ct != NULL
00010551	00410551	0	pt != NULL
000106F0	004106F0	0	ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz0123456789+/-
0001077F	0041077F	0	?456789;<=>
000107B7	004107B7	0	!"#\$%&'()*+,-./0123
00010850	00410850	0	base64.c
00010859	00410859	0	outlen != NULL
00010868	00410868	0	out != NULL
00010874	00410874	0	in != NULL
00010B30	00410B30	0	_ARGCHK '%s' failure on line %d of file %s
00010B8B	00410B8B	0	crypt.c

00010B93	00410B93	0	name != NULL
00010D79	00410D79	0	cipher != NULL
00010E70	00410E70	0	hash != NULL
00010F7A	00410F7A	0	prng != NULL
000110F0	004110F0	0	LibTomCrypt 0.83
00011102	00411102	0	Endianess: little (32-bit words)
00011123	00411123	0	Clean stack: disabled
00011139	00411139	0	Ciphers built-in:
0001114B	0041114B	0	Blowfish
00011157	00411157	0	RC2
0001115E	0041115E	0	RC5
00011165	00411165	0	RC6
0001116C	0041116C	0	Serpent
00011177	00411177	0	Safer+
00011181	00411181	0	Safer
0001118A	0041118A	0	Rijndael
00011196	00411196	0	XTEA
0001119E	0041119E	0	Twofish
000111AA	004111AA	0	CAST5
000111B3	004111B3	0	Noekeon
000111BF	004111BF	0	Hashes built-in:
000111D0	004111D0	0	SHA-512
000111DB	004111DB	0	SHA-384
000111E6	004111E6	0	SHA-256
000111F1	004111F1	0	TIGER
000111FA	004111FA	0	SHA1
00011202	00411202	0	MD5
00011209	00411209	0	MD4
00011210	00411210	0	MD2
00011218	00411218	0	Block Chaining Modes:
0001122E	0041122E	0	CFB
00011235	00411235	0	OFB
0001123C	0041123C	0	CTR
00011244	00411244	0	PRNG:
0001124A	0041124A	0	Yarrow
00011254	00411254	0	SPRNG
0001125D	0041125D	0	RC4
00011265	00411265	0	PK Algs:
0001126E	0041126E	0	RSA
00011275	00411275	0	DH

0001127B	0041127B	0	ECC
00011282	00411282	0	KR
00011289	00411289	0	Compiler:
00011293	00411293	0	WIN32 platform detected.
000112AF	004112AF	0	GCC compiler detected.
000112CA	004112CA	0	Various others: BASE64 MPI HMAC
00011313	00411313	0	/dev/random
00011430	00411430	0	Microsoft Base Cryptographic Provider v1.0
000114D2	004114D2	0	bits.c
000114D9	004114D9	0	buf != NULL
000114F6	004114F6	0	t9VWS
0001154A	0041154A	0	prng != NULL
00011832	00411832	0	<"tx< tf< t
00011846	00411846	0	< tV< t
00011852	00411852	0	< tJ< tF
00011A10	00411A10	0	-LIBGCCW32-EH-SJLJ-GTHR-MINGW32
000130B0	004130B0	0	<ip> <total secs> <p size> <delay>
00013350	00413350	0	modem
00013358	00413358	0	Lan
0001335E	0041335E	0	Proxy
0001336B	0041336B	0	none
00013390	00413390	0	m220 1.0 #2730 Mar 16 11:47:38 2004
000133D4	004133D4	0	unable to %s %s (err: %u)
00013420	00413420	0	unable to kill %s (%u)
00013437	00413437	0	%s killed (pid:%u)
00013470	00413470	0	AVICAP32.dll
0001347D	0041347D	0	unable to kill %u (%u)
00013494	00413494	0	pid %u killed
000134A2	004134A2	0	error!
000134A9	004134A9	0	ran ok
000134B0	004134B0	0	MODE %s +o %s
000134BF	004134BF	0	set %s %s
00013600	00413600	0	Mozilla/4.0
0001360C	0041360C	0	Accept: */*
0001361C	0041361C	0	<DIR>
0001362B	0041362B	0	Could not copy %s to %s
00013643	00413643	0	%s copied to %s
00013653	00413653	0	0123456789abcdef
00013664	00413664	0	%s unset
0001366D	0041366D	0	unable to unset %s

00013AD4	00413AD4	0	(%s) %s
00013ADD	00413ADD	0	%s %s
00013BA0	00413BA0	0	libssl32.dll
00013BAD	00413BAD	0	libeay32.dll
00013BE0	00413BE0	0	<diel join part raw msg>
0011B67A	0051B67A	0	AdjustTokenPrivileges
0011B692	0051B692	0	CloseServiceHandle
0011B6AA	0051B6AA	0	CreateServiceA
0011B6BE	0051B6BE	0	CryptAcquireContextA
0011B6D6	0051B6D6	0	CryptGenRandom
0011B6EA	0051B6EA	0	CryptReleaseContext
0011B702	0051B702	0	GetUserNameA
0011B712	0051B712	0	LookupPrivilegeValueA
0011B72A	0051B72A	0	OpenProcessToken
0011B73E	0051B73E	0	OpenSCManagerA
0011B752	0051B752	0	RegCloseKey
0011B762	0051B762	0	RegCreateKeyExA
0011B776	0051B776	0	RegSetValueExA
0011B78A	0051B78A	0	RegisterServiceCtrlHandlerA
0011B7AA	0051B7AA	0	SetServiceStatus
0011B7BE	0051B7BE	0	StartServiceCtrlDispatcherA
0011B7DE	0051B7DE	0	AddAtomA
0011B7EA	0051B7EA	0	CloseHandle
0011B7FA	0051B7FA	0	CopyFileA
0011B806	0051B806	0	CreateDirectoryA
0011B81A	0051B81A	0	CreateFileA
0011B82A	0051B82A	0	CreateMutexA
0011B83A	0051B83A	0	CreatePipe
0011B84A	0051B84A	0	CreateProcessA
0011B85E	0051B85E	0	CreateToolhelp32Snapshot
0011B87A	0051B87A	0	DeleteFileA
0011B88A	0051B88A	0	DuplicateHandle
0011B89E	0051B89E	0	EnterCriticalSection
0011B8B6	0051B8B6	0	ExitProcess
0011B8C6	0051B8C6	0	ExitThread
0011B8D6	0051B8D6	0	FileTimeToSystemTime
0011B8EE	0051B8EE	0	FindAtomA
0011B8FA	0051B8FA	0	FindClose
0011B906	0051B906	0	FindFirstFileA
0011B91A	0051B91A	0	FindNextFileA

0011B92A	0051B92A	0	FreeLibrary
0011B93A	0051B93A	0	GetAtomNameA
0011B94A	0051B94A	0	GetCommandLineA
0011B95E	0051B95E	0	GetCurrentDirectoryA
0011B976	0051B976	0	GetCurrentProcess
0011B98A	0051B98A	0	GetCurrentThreadId
0011B9A2	0051B9A2	0	GetExitCodeProcess
0011B9BA	0051B9BA	0	GetFileSize
0011B9CA	0051B9CA	0	GetFullPathNameA
0011B9DE	0051B9DE	0	GetLastError
0011B9EE	0051B9EE	0	GetModuleFileNameA
0011BA06	0051BA06	0	GetModuleHandleA
0011BA1A	0051BA1A	0	GetProcAddress
0011BA2E	0051BA2E	0	GetStartupInfoA
0011BA42	0051BA42	0	GetSystemDirectoryA
0011BA5A	0051BA5A	0	GetSystemInfo
0011BA6A	0051BA6A	0	GetTempPathA
0011BA7A	0051BA7A	0	GetTickCount
0011BA8A	0051BA8A	0	GetVersionExA
0011BA9A	0051BA9A	0	GlobalMemoryStatus
0011BAB2	0051BAB2	0	InitializeCriticalSection
0011BACE	0051BACE	0	IsBadReadPtr
0011BADE	0051BADE	0	LeaveCriticalSection
0011BAF6	0051BAF6	0	LoadLibraryA
0011BB06	0051BB06	0	MoveFileA
0011BB12	0051BB12	0	OpenProcess
0011BB22	0051BB22	0	PeekNamedPipe
0011BB32	0051BB32	0	Process32First
0011BB46	0051BB46	0	Process32Next
0011BB56	0051BB56	0	QueryPerformanceFrequency
0011BB72	0051BB72	0	ReadFile
0011BB7E	0051BB7E	0	ReleaseMutex
0011BB8E	0051BB8E	0	RemoveDirectoryA
0011BBA2	0051BBA2	0	SetConsoleCtrlHandler
0011BBBA	0051BBBA	0	SetCurrentDirectoryA
0011BBD2	0051BBD2	0	SetFilePointer
0011BBE6	0051BBE6	0	SetUnhandledExceptionFilter
0011BC06	0051BC06	0	Sleep
0011BC0E	0051BC0E	0	TerminateProcess
0011BC22	0051BC22	0	WaitForSingleObject

0011BC3A	0051BC3A	0	WriteFile
0011BC46	0051BC46	0	_itoa
0011BC4E	0051BC4E	0	_stat
0011BC56	0051BC56	0	_strdup
0011BC62	0051BC62	0	_stricmp
0011BC6E	0051BC6E	0	__getmainargs
0011BC7E	0051BC7E	0	__p__environ
0011BC8E	0051BC8E	0	__p__fmode
0011BC9E	0051BC9E	0	__set_app_type
0011BCB2	0051BCB2	0	_beginthread
0011BCC2	0051BCC2	0	_cexit
0011BCCE	0051BCCE	0	_errno
0011BCDA	0051BCDA	0	_fileno
0011BCEE	0051BCEE	0	_onexit
0011BCFA	0051BCFA	0	_setmode
0011BD06	0051BD06	0	_vsnprintf
0011BD16	0051BD16	0	abort
0011BD1E	0051BD1E	0	atexit
0011BD32	0051BD32	0	clock
0011BD3A	0051BD3A	0	fclose
0011BD46	0051BD46	0	fflush
0011BD52	0051BD52	0	fgets
0011BD5A	0051BD5A	0	fopen
0011BD62	0051BD62	0	fprintf
0011BD6E	0051BD6E	0	fread
0011BD7E	0051BD7E	0	fwrite
0011BD8A	0051BD8A	0	malloc
0011BD96	0051BD96	0	memcpy
0011BDA2	0051BDA2	0	memset
0011BDAE	0051BDAE	0	printf
0011BD8A	0051BD8A	0	raise
0011BDCA	0051BDCA	0	realloc
0011BDD6	0051BDD6	0	setvbuf
0011BDE2	0051BDE2	0	signal
0011BDEE	0051BDEE	0	sprintf
0011BDF8	0051BDF8	0	srand
0011BE02	0051BE02	0	strcat
0011BE0E	0051BE0E	0	strchr
0011BE1A	0051BE1A	0	strcmp
0011BE26	0051BE26	0	strcpy

0011BE32	0051BE32	0	strerror
0011BE3E	0051BE3E	0	strncat
0011BE4A	0051BE4A	0	strncmp
0011BE56	0051BE56	0	strncpy
0011BE62	0051BE62	0	strstr
0011BE76	0051BE76	0	toupper
0011BE82	0051BE82	0	ShellExecuteA
0011BE92	0051BE92	0	DispatchMessageA
0011BEA6	0051BEA6	0	ExitWindowsEx
0011BEB6	0051BEB6	0	GetMessageA
0011BEC6	0051BEC6	0	PeekMessageA
0011BED6	0051BED6	0	GetFileVersionInfoA
0011BEEE	0051BEEE	0	VerQueryValueA
0011BF02	0051BF02	0	InternetCloseHandle
0011BF1A	0051BF1A	0	InternetGetConnectedState
0011BF36	0051BF36	0	InternetOpenA
0011BF46	0051BF46	0	InternetOpenUrlA
0011BF5A	0051BF5A	0	InternetReadFile
0011BF6E	0051BF6E	0	WSAGetLastError
0011BF82	0051BF82	0	WSASocketA
0011BF92	0051BF92	0	WSAStartup
0011BFA2	0051BFA2	0	__WSAFDIsSet
0011BFB2	0051BFB2	0	accept
0011BFC6	0051BFC6	0	closesocket
0011BFD6	0051BFD6	0	connect
0011BFE2	0051BFE2	0	gethostbyaddr
0011BFF2	0051BFF2	0	gethostbyname
0011C002	0051C002	0	gethostname
0011C012	0051C012	0	getsockname
0011C022	0051C022	0	htonl
0011C02A	0051C02A	0	htons
0011C032	0051C032	0	inet_addr
0011C03E	0051C03E	0	inet_ntoa
0011C04A	0051C04A	0	ioctlsocket
0011C05A	0051C05A	0	listen
0011C066	0051C066	0	ntohl
0011C076	0051C076	0	select
0011C08A	0051C08A	0	sendto
0011C096	0051C096	0	setsockopt
0011C0A6	0051C0A6	0	shutdown

0011C0B2	0051C0B2	0	socket
0011C0FC	0051C0FC	0	ADVAPI32.DLL
0011C1FC	0051C1FC	0	KERNEL32.dll
0011C21C	0051C21C	0	msvcrt.dll
0011C2E0	0051C2E0	0	msvcrt.dll
0011C2F0	0051C2F0	0	SHELL32.DLL
0011C30C	0051C30C	0	USER32.dll
0011C320	0051C320	0	VERSION.dll
0011C340	0051C340	0	WININET.DLL
0011C3B4	0051C3B4	0	WS2_32.DLL
0011D071	0051D071	0	VirtualAlloc
0011D07E	0051D07E	0	VirtualFree
0011D441	0051D441	0	kernel32.dll
0011D44E	0051D44E	0	ExitProcess
0011D45A	0051D45A	0	user32.dll
0011D465	0051D465	0	MessageBoxA
0011D471	0051D471	0	wsprintfA
0011D47B	0051D47B	0	LOADER ERROR
0011D488	0051D488	0	The procedure entry point %s could not be located in the dynamic link library %s
0011D4D9	0051D4D9	0	The ordinal %u could not be located in the dynamic link library %s
0011D6E6	0051D6E6	0	(08@P
0011D874	0051D874	0	D4 M
0011D9C0	0051D9C0	0	;;F,s
0011D9CF	0051D9CF	0	;;F0s
0011D9DB	0051D9DB	0	;F4s
0011DCB5	0051DCB5	0	D\$\$W3
0011DF6C	0051DF6C	0	kernel32.dll
0011DF7B	0051DF7B	0	GetProcAddress
0011DF8C	0051DF8C	0	GetModuleHandleA
0011DF9F	0051DF9F	0	LoadLibraryA
0011E074	0051E074	0	advapi32.dll
0011E081	0051E081	0	msvcrt.dll
0011E08C	0051E08C	0	msvcrt.dll
0011E097	0051E097	0	shell32.dll
0011E0A3	0051E0A3	0	user32.dll
0011E0AE	0051E0AE	0	version.dll
0011E0BA	0051E0BA	0	wininet.dll
0011E0C6	0051E0C6	0	ws2_32.dll

0011E113	0051E113	0	AdjustTokenPrivileges
0011E12B	0051E12B	0	_itoa
0011E133	0051E133	0	__getmainargs
0011E143	0051E143	0	ShellExecuteA
0011E153	0051E153	0	DispatchMessageA
0011E166	0051E166	0	GetFileVersionInfoA
0011E17C	0051E17C	0	InternetCloseHandle
0011E192	0051E192	0	WSAGetLastError

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